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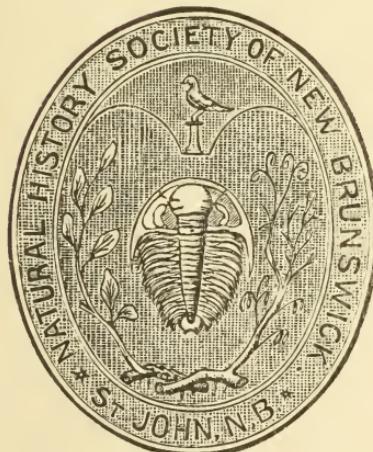
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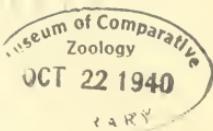


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## THE FRESH WATER DIATOMS AND DIATOMACEOUS EARTHS OF NEW BRUNSWICK.

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By L. W. BAILEY, LL. D., F. R. S. C.

In the last Bulletin of this Society the writer gave a general account of the structure and relations of Diatoms, together with lists and illustrations of the marine and estuarine forms which, up to that time, had been observed along the New Brunswick seaboard. He now proposes to enumerate and describe the related forms to be found in the fresh waters of the Province as well as those which, in a semi-fossil form, are to be found in connection with some of the lakes and ponds of the latter, constituting what are variously known as "Diatomaceous Earths," "Infusorial Earths," and "Tripolite."

### I.—FRESH WATER DIATOMS.

In attempting to enumerate the fresh water species of Diatoms a difficulty is at once met with, viz., that of determining what forms are really of this character as distinguished from those which are typically marine. Such species as are found in lakes and ponds, or in running streams, are of course fluviatile or lacustrine, but, where these empty into the sea, they may be carried into the latter, and thus to some extent become commingled with marine forms. Moreover, when, as is the case particularly with the St. John River and the Miramichi, these are really estuarine, and are brackish for many miles above their mouths, the presence of saline conditions, even though in

a greatly diluted form, may make possible the presence of species which, were it not for the presence of some degree of salinity, would probably not be found at all in such waters. It has been found also that the commingling of fresh and salt waters affects the character as well as the number of species occurring where such admixture takes place, the usual effect, whether the transfer of habitat be from fresh to salt water or the reverse, being the diminution in the amount of silica secreted, and the consequent decrease in the clearness of striation and sometimes the complete disappearance of the latter. It is also altogether probable that, as with other forms of plant life, the Diatoms are sensitive to their surroundings, and that, among fresh water forms, some prefer still, others running water, some boggy pools or mountain lakes, but differences of this kind have not yet been sufficiently studied to make any definite conclusions possible.

The fresh water Diatoms possess as a group some general characteristics. They usually abound in attached and concatenate forms, such as those of *Diatoma*, *Meridion*, *Himantidium*, *Fragillaria*, *Tabellaria*, etc., though some species belonging to these genera are marine. Most of the species of *Epithemia*, of *Eunotia* and of *Cymbella* are confined to fresh water, while Naviculoid forms, like *Navicula* and *Pinnularia* and *Stauroneis*, are of common occurrence, as well as attached and clustered forms, like *Synedra*, *Colletonema* and *Encyonema*. On the other hand circular forms, such as *Coscinodiscus*, and triangular and quadrangular forms, like *Triceratium* and *Biddulphia*, are seldom or never met with.

The abundance of Diatoms in some of the lakes of the Province is quite remarkable, being, in connection with other fresh water Algae, such as to thicken their waters to such an extent as to impede the passage of a boat. One illustration of this is to be found in what Dr. Ganong has termed Diatom lake, a considerable sheet of water connected with the Nepisiquit River near its head; and another is Pocowogamis Lake, near the main road traversing Pocowogamis Settlement in York County.

In the latter case the consistency of the water, in mid-summer, was like that of porridge. Unfortunately specimens collected from these localities are not now available, and the identity of the species concerned in producing this curious effect is not known. The occurrence of such vast numbers of living Diatoms in situations of this kind goes far to explain the origin of the "Infusorial Earths" or "Tripolite" deposits to be presently noticed.

In the following lists of species it is proposed to give (1) those which are seldom or never found in any other waters than those of brooks, rivers above tide water, or ponds and lakes, and (2) those of doubtful habitat, found in the lower courses of the St. John River and Kennebecasis, where the waters are more or less under the influence of tidal flow, and where the salinity varies from that of the Bay of Fundy at the Falls to where it becomes quite imperceptible. In this latter case there is also considerable variation with the depth of water, the surface waters being often quite fresh while those a few feet down are decidedly salt. And yet again with the seasons, the high freshets of spring being sufficient to prevent altogether the entrance of the sea-water. As the Diatoms live only near the surface where the light can reach them, it is not probable that the conditions which prevail in the deeper parts of the Kennebecasis, which reaches a depth of nearly 200 feet and the temperature in midsummer is about seventeen degrees above freezing, can greatly affect them.

#### LISTS OF FRESH WATER DIATOMS.

##### I. From brook near Biological Station, St. Andrews:

<i>Diatoma elongatum</i> Ag.	<i>Melosira.</i>
<i>Diatoma vulgare</i> Bory.	<i>Meridion circulare</i> Ag.
<i>Cocconema lanceolatum</i> Ehr.	<i>Navicula.</i>
<i>Gomphonema acuminatum</i> Ehr.	<i>Tabellaria flocculosa</i> Kutz.
<i>Epithemia.</i>	<i>Pinnularia viridis</i> W. Sm.
<i>Himantidium arcus</i> W. Sm.	<i>Synedra lunaris</i> Ehr.

## 2. Chamcook Lake and Outlet:

<i>Diatoma vulgare</i> Bory.	<i>Epithemia turgida</i> W. Sm.
<i>Diatoma elongatum</i> Ag.	<i>Nitschia Tryblionella</i> .
<i>Meridion circulare</i> Ag.	<i>Nitschia sigmoidea</i> W. Sm.
<i>Cocconema lanceolatum</i> Ehr.	<i>Synedra ulna</i> Ehr.
<i>Gomphonema geminatum</i> Ag.	<i>Himantidium arcus</i> W. Sm.
<i>Orthosira punctata</i> ?	<i>Himantidium undulatum</i> W. Sm.
<i>Orthosira orichalcea</i> W. Sm.	<i>Tryblionella gracilis</i> .
<i>Melosira varians</i> Ag.	<i>Nitschia Tryblionella?</i> Hantz.
<i>Pinnularia viridis</i> W. Sm.	<i>Tabellaria flocculosa</i> Kutz.
<i>Pinnularia major</i> W. Sm.	<i>Tabellaria fenestrata</i> Kutz.
<i>Navicula elliptica</i> Kutz.	<i>Surirella splendida</i> Kutz.
<i>Navicula mesolepta</i> Kutz.	<i>Surirella elegans</i> Ehr.
<i>Navicula polyonca</i> Breb.	<i>Pleurosigma Spencerii</i> W. S.
<i>Navicula trinodis</i> . S. B. D.	<i>Pleurosigma attenuatum</i> W. Sm.
<i>Navicula dilatata</i> Ehr.	<i>Cymbella cuspidata</i> Kutz.
<i>Navicula Brebissonii</i> Kg.	<i>Cyclotella compta</i> Kg.
<i>Navicula acrosphaenia</i> Kg.	<i>Asterionella formosa</i> .
<i>Stauroneis phoenicenteron</i> Ehr.	<i>Amphora ovalis</i> Kutz.
<i>Stauroneis acuta?</i> W. Sm.	<i>Gomphonema</i> .
<i>Stauroneis anceps</i> Ehr.	<i>Eunotia tetraodon</i> .
<i>Stauroneis Stodderii</i> Lewis?	

Chamcook Lake is about one and a half miles from Passamaquoddy Bay, is about ninety-five feet above tide level, and has a maximum depth of 200 feet. The above collection is a typical one.

## 3. In brook beside railway track, Fredericton:

<i>Diatoma vulgare</i> Bory.	<i>Navicula amphirhyncus</i> Ehr.
<i>Himantidium arcus</i> W. Sm.	<i>Synedra ulna</i> Ehr.
<i>Meridion circulare</i> Ag.	<i>Synedra lunaris</i> .
<i>Pinnularia viridis</i> W. Sm.	<i>Stauroneis phoenicenteron</i> Ehr.

## 4. From melting ice of St. John River at Fredericton.

<i>Fragillaria capucina</i> Desm.	<i>Synedra lunaris</i> Ehr.
<i>Tabellaria flocculosa</i> Kutz.	<i>Surirella</i> .
<i>Cymbella Helvetica</i> W. Sm.	<i>Gomphonema acuminatum</i> Ehr.
<i>Eunotia Monodon</i> Ehr.	<i>Gomphonema geminatum</i> A.
<i>Himantidium arcus</i> W. Sm.	<i>Pinnularia nobilis</i> .
<i>Cocconema lanceolatum</i> Ehr.	<i>Navicula tumida</i> ?
<i>Nitschia amphioxys</i> .	<i>Stauroneis phoenicenteron</i> Ehr.
<i>Synedra ulna</i> Ehr.	<i>Odontidium mesodon</i> Kutz.

## II.—DIATOMS OF THE LOWER ST. JOHN AND KENNEBECASIS.

(More or less subject to conditions of salinity.)

In the Bulletin of the Society for 1910, a somewhat lengthy list of the Diatoms found at Harris's (or Matthew's) cove on the Kennebecasis is given, together with descriptions of the genera and illustrative plates, the assemblage indicating an admixture of fresh water and marine forms. As this collection is by far the most complete as yet made, as well as that which has been most carefully studied, it has been thought well to reproduce it here in condensed form, at the same time that an attempt is made to distinguish between the species which may fairly be regarded as fresh water and those which are estuarine or marine. It may thus be taken as a basis of comparison, and by making such comparison with the forms obtained from other parts of the lower St. John and Kennebecasis, some idea of the range of species may be obtained, and possibly some light be thrown upon the question of the influence of fresh and salt waters respectively upon their distribution.

The collections, other than that of Harris's Cove which is taken as the standard, are arranged in two series, the first extending from the foot of the Long Reach and mouth of the Nerepis by the Milkish, Grand Bay and the Narrows above Indiantown, to St. John Harbor; and the second from Perry's Point at the head of Kennebecasis Bay through Saunderson's Cove, Matthew's Cove, Rothesay and Millidgeville, to where the Kennebecasis and St. John waters unite off Boar's Head.

The collections referred to have been revised by Dr. A. H. MacKay, Chief Superintendent of Education, Halifax, N. S., and Mr. Oliver Kendall, of Providence, R. I., and to these gentlemen I am indebted for the addition of a considerable number of species not determinable with the literature at my command.

## Diatoms from Harris's or Matthew's Cove, Kennebecasis.

## I. FRESH WATER FORMS.

<i>Amphora ovalis</i> Kutz.	<i>Navicula nobilis</i> Ehr.
<i>Eunotia arcus</i> Kutz.	<i>N. major</i> Kutz.
<i>Cocconeis lanceolatum</i> Ehr.	<i>N. viridis</i> Kutz.
<i>Cocconeis Placentula</i> Ehr.	<i>N. maculata</i> Bail.
<i>Cymbella Ehrenbergii</i> Kutz.	<i>Nitschia sigmoidea</i> W. Sm.
<i>Encyonema coespitosum</i> K.	<i>Pleurosigma attenuatum</i> W. Sm.
<i>Epithemia turgida</i> Ehr.	<i>Stauroneis anceps</i> Ehr.
<i>E. gibba</i> Kutz.	<i>S. phoenicenteron</i> Ehr.
<i>E. zebra</i> Ehr.	<i>Surirella splendida</i> Ehr.
<i>Eunotia monodon</i> Ehr.	<i>S. ovata</i> Kutz.
<i>E. diodon</i> Ehr.	<i>S. ovalis</i> Breb.
<i>Gomphonema acuminatum</i> Ehr.	<i>S. biseriata</i> W. Sm.
<i>Odontidium mutabile</i> S. B. D.	<i>Synedra pulchella</i> Kutz.
<i>Melosira varians</i> Ag.	<i>S. ulna</i> Ehr.
<i>M. granulata</i> .	<i>Tabellaria fenestrata</i> Kutz.

## 2. MARINE OR BRACKISH WATER FORMS.

<i>Amphiprora alata</i> Kutz.	<i>Navicula peregrina</i> Kutz.
<i>Acnanthes subsessilis</i> Ehr.	<i>N. Smithii</i> var. <i>ovalis</i> .
<i>Biddulphia aurita</i> Lyn.	<i>N. elliptica</i> Kutz.
<i>B. laevis</i> Ehr.	<i>N. marina</i> Ralfs.
<i>Campylodiscus cibrosus</i> W. Sm.	<i>N. bilobata</i> W. Sm.
<i>Cocconeis scutellum</i> Ehr.	<i>Nitschia sigma</i> W. Sm.
<i>Coscinodiscus radiatus.</i>	<i>N. scalaris</i> W. Sm.
<i>C. lineatus.</i>	<i>N. angularis</i> W. Sm.
<i>C. eccentricus.</i>	<i>Raphoneis amphiceros</i> Ehr.
<i>C. marginatus.</i>	<i>Striatella unipunctata</i> Ag.
<i>Cyclotella Kutzngiana.</i>	<i>Surirella ovata</i> Kutz.
<i>Doryphora (Raphoneis) Boeckii</i> W. S.	<i>S. constricta</i> W. S.
<i>D. amphiceros</i> Kutz.	<i>Synedra arcus</i> Kutz.
<i>Epithemia musculus</i> Kutz.	<i>Tryblionella gracilis</i> W. S.
<i>Grammatophora marina</i> Kutz.	<i>Try. scutellum</i> W. Sm.
<i>G. serpentina</i> Kutz.	<i>Triceratium alternans</i> Bail.
<i>Homoecladia filiformis</i> W. S.	<i>Surirella striatula</i> Turp.
<i>Mastogloia Smithii</i> Thw.	<i>S. Brightwellii</i> W. Sm.
<i>Melosira Borrerii</i> Grev.	

In addition to the above the following species, constituting a little less than one-half of all those observed, also occur at this point:

<i>Coscinodiscus pellucida.</i>	<i>Meridion intermedium.</i>
<i>C. Americana.</i>	<i>Nitschia punctata</i> Sm.
<i>C. griseus.</i>	<i>N. Tryblionella.</i>
<i>Cymbella gastrooides</i> K.	<i>N. circumsuta</i> Bail.
<i>C. lanceolata.</i>	<i>N. thermalis.</i>
<i>Cyclotella Meneghiniana.</i>	<i>N. angularis</i> W. Sm.
<i>Diatoma tenue</i> C. Ag.	<i>N. longissima</i> Ralfs.
<i>D. hyemale</i> Lyngb.	<i>N. granulata</i> Grun.
<i>Encyonema ventricosum</i> K.	<i>N. paradoxa</i> Grun?
<i>Eunotia pectinalis.</i>	<i>N. constricta</i> Grun (?)
<i>E. lunaris.</i>	<i>N. littoralis</i> G.
<i>E. major.</i>	<i>N. levidensis.</i>
<i>Fragillaria Pacifica</i> Grun?	<i>Rhoicosphenia curvata</i> Grun.
<i>Fr. construens?</i> Grun.	<i>Schizonema ramossissimum</i> Ehr.
<i>F. mutabilis</i> Grun.	<i>Stauroneis spicula</i> Dick.
<i>Gomphonema angustatum.</i>	<i>Surirella Mollerianum</i> Grun.
<i>G. exiguum.</i>	<i>S. crumena</i> Breb. (= <i>S. Brightwellii</i> W. Sm.)
<i>Licmophora Lyngbei</i> G.	<i>S. striatula</i> Turp.
<i>Mastogloia octogona.</i>	<i>Synedra arcus</i> Ktz.
<i>M. crenulata.</i>	<i>Plagiotropis vitrea.</i>
<i>Navicula roteana</i> Grun.	<i>Licmophora tincta.</i>
<i>N. permagna</i> Bail.	
<i>N. minuscula.</i>	

As to these forms the writer is in doubt as to how they should be referred. It may, however, be said that *Coscinodiscus* is essentially a marine genus, Smith giving only one species (*C. minor*) as being of fresh water habitat. The *Cymbellas*, as given by Smith, are all fresh water forms. The *Cyclotellas* include both fresh and salt water species.

I. Diatoms from soundings (4 fathoms), St. John River, above Gregory's Point at foot of Long Reach:

<i>Epithemia Argus</i> W. Sm.	<i>Navicula rhynchocephala?</i> Kutz.
<i>Epithemia turgida</i> Ehr.	<i>Stauroneis.</i>
<i>Tabellaria fenestrata</i> Kutz.	<i>Surirella.</i>
<i>Synedra lunaris</i> Ehr.	<i>Melosira subflexilis</i> Kutz.
<i>Synedra ulna</i> Ehr.	<i>Cocconeis scutellum</i> Ehr.
<i>Synedra radians.</i>	<i>Gomphonema geminatum</i> A.
<i>Navicula elliptica</i> Smith.	

2. Pond adjoining St. John River just below Harding's Point:

<i>Navicula rhynchocephala?</i> Kutz.	<i>Stauroneis phenicenteron</i> Ehr.
<i>Pinnularia major</i> Ktz.	<i>Cocconeis Placentula</i> Ehr.
<i>Epithemia turgida</i> Ehr.	<i>Pleurosigma attenuatum</i> W. Sm.
<i>Epithemia zebra</i> Ehr.	<i>Melosira subflexilis</i> Kutz.
<i>Synedra ulna</i> Ehr.	<i>Melosira varians</i> Ag.
<i>Synedra gracilis?</i>	<i>Bacillaria paradoxa</i> Gmel.
<i>Tabellaria flocculosa</i> Kutz.	<i>Doryphora Boeckii</i> W. Sm.
<i>Nitschia bilobata</i> W. Sm.	<i>Eunotia monodon</i> Ehr.
<i>Nitschia sigma</i> W. Sm.	<i>Himantidium arcus</i> W. Sm.
<i>Nitschia linearis</i> W. Sm.	<i>Diatoma elongatum</i> Ag.
<i>Surirella ovata</i> Kutz.	<i>Fragillaria capucina?</i> Desm.
<i>Cocconeema lanceolatum</i> Ehr.	<i>Gomphonema constrictum.</i>

Diatoms from mouth of Nerepis River:

The collections from which the following Diatoms were obtained were made in the vicinity of the Nerepis Bridge, and near where the waters of the Nerepis River mingle with those of the main St. John. In the channel of the latter, during flood tide, a slight degree of salinity may be recognized, but it is doubtful whether this reaches the Nerepis proper or has any influence upon the character of its Diatom life. All the species enumerated are usually regarded as fresh water forms, though a few of them are also to be found in waters that are brackish.

<i>Tabellaria flocculosa</i> Kutz.	<i>Stauroneis phenicenteron</i> Ehr.
<i>Epithemia turgida</i> Ehr.	<i>Fragillaria capucina?</i>
<i>Epithemia zebra</i> Ehr.	<i>Doryphora Boeckii</i> W. Sm.
<i>Himantidium undulatum</i> W. Sm.	<i>Cocconeis placentula</i> Ehr.
<i>Himantidium gracile?</i> Ehr.	<i>Cocconeis pediculus</i> Ehr.
<i>Melosira varians</i> Ag.	<i>Gomphonema geminatum</i> Ag.
<i>Melosira subflexilis</i> Kutz.	<i>Gomphonema acuminatum</i> Ehr.
<i>Bacillaria paradoxa</i> Gmel.	<i>Cocconeema lanceolatum</i> Ehr.
<i>Nitschia bilobata</i> W. Sm.	<i>Surirella splendida</i> Ktz.
<i>Nitschia sigmoidea</i> Ehr.	<i>Surirella Mollerianum</i> Grun.
<i>Navicula maculata</i> Bail.	<i>Surirella</i> .
<i>Navicula Smithii</i> var. <i>ovalis</i> .	<i>Diatoma vulgare</i> Bory.
<i>Navicula</i> .	<i>Eunotia tetraodon</i> Ehr.
<i>Navicula</i> .	<i>Eunotia monodon</i> Ehr.
<i>Pinnularia acrosphenea?</i>	<i>Campylodiscus cribrosus</i> W. Sm.
<i>Pinnularia major</i> Ktz.	<i>Cyclotella</i> .
<i>Pinnularia viridis</i> Ktz.	<i>Pleurosigma</i> .
<i>Synedra ulna</i> Ehr.	<i>Cymatopleura apiculata.</i>

## 3. Diatoms from mud of St. John River at Ingleside:

Navicula Smithii var. ovalis.	Coscinodiscus.
Synedra ulna Ehr.	Cymatopleura?
Synedra pulchella Ktz.	Odontidium mutabile W. Sm.
Melosira varians Ag. very com.	Himantidium arcus W. Sm.
Melosira nummuloides Kutz.	Cocconema lanceolatum Ehr.
Melosira Boeckii rare.	Cymbella cuspidata Kutz.
Doryphora Boeckii W. Sm.	Surirella ovata Kutz.
Amphiprora alata Kutz.	Campylodiscus cribrosus W. Sm.
Acnanthes subsessilis Kutz.	Amphipleura pellucida Kutz.
Navicula Smithii var. ovalis.	Pinnularia viridis Ktz.
Navicula maculata Bail.	Tabellaria fenestrata Kutz.
Epithemia turgida Ehr.	Tryblionella scutellum W. Sm.
Doryphora Boeckii W. Sm.	Nitschia bilobata W. Sm.
Stauroneis.	

## Diatoms from mud at head of the Milkish:

Actinoptychus undulatus.	Navicula Smithii var. ovalis.
Coscinodiscus.	Amphiprora alata Kutz.
Cocconeis Placentula Ehr.	Pinnularia mesolepta Ehr.
Cocconeis pediculus Ehr.	Pinnularia viridis Ktz.
Cocconeis scutellum Ehr.	Nitschia closterium W. Sm.
Cyclotella comptata?	Nitschia sigma? W. Sm.
Cyclotella Kutzingiana?	Nitschia linearis W. Sm.
Doryphora Boeckii Sm.	Gomphonema cristatum Ralfs.
Doryphora amphiceros Kutz.	Cocconema lanceolatum Ehr.
Epithemia musculus Kutz.	Tabellaria flocculosa Kutz.
Epithemia turgida Ehr.	Tabellaria fenestrata Kutz.
Epithemia zebra Ehr.	Surirella splendida Kutz.
Eunotia diodon Ehr.	Surirella ovata Kutz.
Encyonema?	Rhizosolenia.
Cymbella.	Stauroneis phenicenteron Ehr.
Himantidium arcus W. Sm.	Zygoceros.
Melosira nummuloides Kutz.	Synedra arcus Kutz.
Melosira varians Ag.	Pleurosigma angulatum W. Sm.
Melosira subflexilis? Kutz.	Pleurosigma Balticum W. Sm.

Of the above forms *Cyclotella Kutzingiana*, and *Navicula closterium* have brackish water affinities, while *Rhabdonema* and *Rhizosolenia*, if correctly referred, are decidedly marine. In addition to Diatoms a Foraminifer and an Infusorian (*Distephanus speculum*) were observed here, both common to the Bay of Fundy.

Mud from Narrows of St. John River, Swift Point, 25 faths.

Rhabdonema minutum.	Melosira.
Tabellaria.	Epithemia.
Cyclotella Kutzngiana.	Synedra.
Melosira nummuloides Kutz.	Nitschia.

Narrows of St. John River, Plankton collection:

Navicula Smithii var. ovalis.	Bacillaria paradoxa Gmel.
Navicula viridis Ktz.	Cocconema lanceolatum Ehr.
Melosira nummuloides Kutz.	Synedra salina W. Sm.
Melosira varians Ag.	Synedra radians? W. Sm.
Isthmia enervis Ehr.	Navicula Smithii var. ovalis.
Actinoptychus undulatus.	Navicula viridis W. Sm.
Amphiprora ornata.	Surirella striatula Turp.
Coccineis.	Surirella elegans?
Campylodiscus cribrosus W. Sm.	Bacillaria paradoxa Gmel.
Coscinodiscus radiatus.	Pleurosigma attenuatum W. Sm.
Doryphora Boeckii W. Sm.	Tabellaria fenestrata Kutz.
Tryblionella.	Zygoceros Mobilensis Bail.

In the occurrence of *Isthmia* this gathering shows distinctly marine conditions, while *Bacillaria paradoxa* is decidedly a brackish water form.

Diatoms from old wharves at Indiantown:

Melosira nummuloides Kutz.	Bacillaria paradoxa Gmel.
Melosira.	Navicula.
Nitschia closterium W. Sm.	

*Bacillaria paradoxa* Gmel, said to be the most wonderful of all Diatoms, was found very abundantly near the ferry landing, and its curious movements, so suggestive of animality, may be readily observed in fresh collections from that point. Several species of Diatoms, such as *Doryphora*, *Synedra*, *Melosira* and *Navicula*, may be obtained from the tidal creek at Stetson's Mill. Scrapings from booms above Indiantown yielded the following:

Synedra radians? W. Sm.	Melosira nummuloides Ktz.
Rhoicosphenia curvata Green.	Melosira subflexilis Ktz.
Tryblionella scutellum W. Sm.	Surirella ovata Kutz.
Coccineis.	Homœcladia sigmoidea in tubes.
Nitschia sigma W. Sm.	

## Diatoms from Docks in St. John Harbor.

The following species were obtained from the wharves of the Eastern Steamship Co., and the Ballast wharf in St. John. These are directly washed by the waters of the Bay of Fundy and represent essentially marine conditions, yet must be subject to the influence of the powerful fresh water currents which at times traverse St. John Harbor. The collections made in this vicinity are as yet very imperfect:

<i>Melosira nummuloides</i> Ktz.	<i>Navicula Smithii</i> var. <i>ovalis</i> .
<i>Melosira varians</i> Ag.	<i>Navicula maculata</i> Bail.
<i>Melosira Jurghensii</i> .	<i>Navicula inflata</i> Kutz.
<i>Melosira subflexilis</i> Ktz.	<i>Pleurosigma Aestuarii?</i> W. Sm.
<i>Coscinodiscus radiatus</i> Ehr.	<i>Pleurosigma obscurum</i> W. Sm.
<i>Coscinodiscus minor</i> Ehr.	<i>Pleurosigma fasciola</i> W. Sm.
<i>Grammatophora marina</i> Kutz.	<i>Pleurosigma Balticum</i> W. Sm.
<i>Cocconeis scutellum</i> Ehr.	<i>Pleurosigma hippocampus</i> W. S.
<i>Cocconeis pediculus</i> Ehr.	<i>Pinnularia distans</i> W. Sm.
<i>Doryphora Boeckii</i> W. Sm.	<i>Pinnularia</i> .
<i>Doryphora amphiceros</i> Kutz.	<i>Bacillaria paradoxa</i> Gmel.
<i>Actinopytchus undulatus</i> .	<i>Biddulphia aurita</i> Breb.
<i>Amphiprora alata</i> Kutz.	<i>Nitschia sigmaeidea</i> W. Sm.
<i>Amphiprora ornata</i> .	<i>Nitschia fasciola</i> .
<i>Cyclotella striata</i> Thw.	<i>Nitschia closterium</i> W. Sm.
<i>Cocconema Cistula</i> Ehr.	<i>Nitschia vermicularis</i> .
<i>Mastogloia Smithii</i> Thw.	<i>Cyclotella Kuttingiana</i> Thw.
<i>Acnanthes subsessilis</i> Ktz.	<i>Stephanodiscus Niagara</i> Ehr.
<i>Acnanthes longipes</i> Ag.	<i>Orthosira marina</i> .
<i>Rhabdonema minutum</i> .	<i>Triceratium alternans</i> Bail.
<i>Stauroneis</i> .	<i>Surirella gemma</i> Ehr.
<i>Gomphonema marinum</i> W. Sm.	<i>Surirella minuta</i> Breb.
<i>Gomphonema geminatum</i> Ag.	<i>Amphiprora</i> .
<i>Tryblionella gracilis</i> W. Sm.	<i>Epithemia ventricosa</i> Kutz.
<i>Navicula didyma</i> Kutz.	<i>Synedra ulna</i> Ehr.

From scrapings of old wharves in Courtenay Bay specimens of the following were obtained:

<i>Nitschia closterium</i> W. Sm.	<i>Cocconeis</i> .
<i>Melosira</i> .	<i>Nitschia sigma?</i>

From a comparison of the forms which have now been enumerated (a very incomplete list) with those given from

various stations upon the St. John River, it will, to some extent at least, be seen what species are capable of thriving alike in pure salt water and in that which is partly or greatly freshened.

We now proceed to give the Second or Kennebecasis Series.

1. Diatoms from Perry's Point, Kennebecasis.

At this point, about twenty miles distant from the outlet of the river, and about fifteen from the Narrows, the Kennebecasis rapidly shallows, and, except for a small channel, is largely occupied by a growth of *Potamogeton*. In these respects it nearly resembles the conditions at the mouth of the Nerepis, and, as will appear from the following list, many of the Diatoms found are common to the two. The salinity here is barely appreciable.

Amphipleura pellucida Kutz.	Stauroneis phoenicenteron Ehr.
Amphirora alata Kutz.	Pleurosigma.
Epithemia turgida W. Sm.	Navicula Smithii var. ovalis.
Epithemia argus W. Sm.	Synedra ulna Ehr.
Pinnularia major Kutz.	Amphora ovalis Kutz.
Pinnularia viridis Kutz.	Melosira varians Ag.
Nitschia closterium W. Sm.	Tabellaria flocculosa Kutz.
Nitschia scalaris W. Sm.	Cocconeis scutellum Ehr.
Nitschia sigmoidea W. Sm.	Cocconeis placentula Ehr.
Surirella splendida Kutz.	Doryphora (Raphoneis) Boeckii.
Surirella linearis W. Sm.	Cocconema lanceolatum Ehr.
Campylodiscus cribrosus W. Sm.	Odontidium.
Tryblionella gracilis? W. Sm.	Himantidium arcus W. Sm.

Diatoms from Saundier's Cove, Kennebecasis:

Campylodiscus cribrosus W. Sm.	Amphora ovalis Kutz.
Eunotia diodon Ehr.	Pinnularia viridis W. Sm.
Synedra pulchella Kutz.	Pinnularia mesolepta Ehr.
Synedra ulna Ehr.	Tabellaria fenestrata Kutz.
Cocconema lanceolatum Ehr.	Fragillaria.
Doryphora (Raphoneis) Boeckii W. S.	Nitschia lineatis W. Sm.
Himantidium.	Nitschia bilobata W. Sm.
Surirella splendida Kutz.	Epithemia turgida W. Sm.
Surirella Molleriana.	Cocconeis scutellum Ehr.
Coscinodiscus radiatus.	Melosira subflexilis -Kutz.
Gomphonema acuminatum Ehr.	Pleurosigma.
Gomphonema sp?	

Diatoms from Harris's (or Matthew's) Cove, Kennebecasis.

This locality precedes that of Rothesay, to be next described, and is about ten miles from the main St. John. It forms a marked indentation in the shore line and would seem to be well sheltered from the tidal or other currents which traverse the more open water outside. It is also, in contrast with the waters outside, of very shallow depth, and largely occupied by a dense growth of *Potamogeton*. It was just at the outer edge of this growth, where the water is somewhat deeper, that the remarkable collection already given, was obtained. No fresh water stream of any magnitude enters the cove.

Diatoms from soundings off Rothesay, Kennebecasis Bay:

<i>Bacillaria paradoxa</i> Gmel.	<i>Surirella Brightwellii</i> W. S.
<i>Nitschia scalaris</i> W. Sm.	<i>Raphoneis (Doryphora) amphiceros</i> Ktz.
<i>Nitschia sigma</i> W. Sm.	<i>Raphoneis (Doryphora) Boeckii</i> W. Sm.
<i>Nitschia plana</i> .	<i>Amphiprora alata</i> Ktz.
<i>Nitschia circumsuta</i> Bail.	<i>Amphiprora lepidoptera?</i> Bail.
<i>Nitschia bilobata</i> W. Sm.	<i>Acnanthes subsessilis</i> Ktz.
<i>Nitschia Hungarica</i> Grun.	<i>Actinoptychus subtilis.</i>
<i>Pleurosigma fasciola</i> W. Sm.	<i>Navicula radiosa.</i>
<i>Pleurosigma obscurum</i> W. Sm.	<i>Navicula elegans.</i>
<i>Pleurosigma strigosum</i> W. Sm.	<i>Navicula pelagi.</i>
<i>Pleurosigma macrum.</i>	<i>Navicula Smithii</i> var. <i>ovalis.</i>
<i>Pleurosigma tenuissimum?</i>	<i>Navicula maculata</i> Bail.
<i>Pleurosigma strigilis</i> W. Sm.	<i>Navicula longa.</i>
<i>Pleurosigma Balticum</i> W. Sm.	<i>Tryblionella scutellum?</i> W. S.
<i>Pleurosigma Spencerii</i> W. Sm.	<i>Campylodiscus cribrosus</i> W. S.
<i>Epithemia turgida</i> W. Sm.	<i>Tabellaria flocculosa</i> Ktz.
<i>Epithemia zebra</i> Kutz.	<i>Synedra.</i>
<i>Epithemia musculus.</i>	<i>Stauroneis phoenicenteron</i> Ehr.
<i>Melosira nummuloides</i> Ktz.	<i>Coscinodiscus minor?</i> Ehr.
<i>Melosira Borrerii.</i>	<i>Cymatopleura scutellum.</i>
<i>Melosira Jerghensii</i> var. <i>octogonia</i> Grun.	<i>Pinnularia viridis</i> W. S.
<i>Amphipleura sigmoidea</i> W. Sm.	<i>Cocconema lanceolatum</i> Ehr.
<i>Cocconeis Placentula</i> Ehr.	<i>Gomphonema.</i>
<i>Cocconeis scutellum</i> Ehr.	<i>Amphora ovalis</i> var. <i>gracilis</i> Ehr.
<i>Surirella striatula</i> Turp.	<i>Plagiotropis vitrea</i> Grun.
<i>Surirella ovata</i> Kutz.	

## Diatoms from soundings at Millidgeville:

<i>Actinptychus undulatus.</i>	<i>Navicula didyma</i> Kutz.
<i>Doryphora Boeckii</i> W. Sm.	<i>Tabellaria flocculosa</i> Kutz.
<i>Nitschia scalaris</i> W. Sm.	<i>Tabellaria fenestrata</i> Kutz.
<i>Nitschia sigma</i> W. Sm.	<i>Pinnularia viridis</i> Ehr.
<i>Nitschia closterium</i> W. Sm.	<i>Suirella ovalis</i> Breb.
<i>Epithemia turgida</i> W. Sm.	<i>Suirella Molleriana</i> .
<i>Epithemia zebra</i> Kutz.	<i>Suirella striatula</i> Turp.
<i>Epithemia musculus.</i>	<i>Pleurosigma hippocampus?</i> W. Sm.
<i>Eunotia diadema?</i> or <i>tetraodon.</i>	<i>Pleurosigma</i> sp.
<i>Coscinodiscus eccentricus.</i>	<i>Pleurosigma strigosum?</i> W. Sm.
<i>Cocconeis lanceolatum.</i>	<i>Cocconeis Placentula</i> Ehr.
<i>Cyclotella.</i>	<i>Acnanthes subsessilis</i> Kutz.
<i>Melosira subflexilis</i> Kutz.	<i>Campylodiscus cribrosus.</i>
<i>Melosira varians</i> Ag.	<i>Amphora.</i>
<i>Navicula Smithii</i> var. <i>ovalis.</i>	<i>Distephanus speculum.</i>

This (Kennebecasis) series here connects with that of the St. John River, previously given.

From a comparison of the preceding lists some interesting conclusions may be drawn.

Of the species having the widest range may be mentioned *Navicula Smithii*, var. *ovalis*, a fresh water form, found at Ingleside, Nerepis, Milkish, Perry's Point, Harris's Cove, Millidgeville and the Narrows above Indiantown, but which also occurs in St. John Harbor and Passamaquoddy Bay. *Navicula viridis* and *Tabellaria flocculosa*, also fresh water forms, are widely distributed, but mostly at points somewhat remote from the sea. The same is true of *Stauroneis* and *Diatoma*, essentially fresh water forms. On the other hand *Doryphora*, (*Raphoneis*) *Boeckii*, a marine species occurring in Passamaquoddy Bay, not only abounds in the Narrows of the St. John but is found also at Ingleside and Perry's Point, as well as at other points in the Kennebecasis. Collections from Flewelling's Wharf, on the south side of the latter, are mainly made up of this species, while a second species, *D. amphiceros*, also marine, is much rarer, having as yet been observed only in St. John Harbor and Matthew's or Harris's Cove. *Navicula maculata*, Bail., a fresh water species, first observed in Florida, has been

found in Harris's Cove where it is quite abundant, and at the mouth of the Nerepis. *Amphiprora alata*, a species difficult to detect on account of its delicacy and transparency, has been observed at six different stations, ranging from Ingleside and Perry's Point respectively, to Matthew's Cove, Rothesay and St. John Harbor. It is usually regarded as marine. *Cocconeema lanceolatum*, a fresh water form, ranges from the mouth of the Nerepis to Perry's Point, but has not been observed in the Narrows. *Campylodiscus cribrosus*, marine or brackish, is not uncommon and is widely distributed, being found at Harding's Point, Ingleside, Perry's Point, Saunderson's Cove, Rothesay and Millidgeville. *Cocconeidae* are very common in nearly all the gatherings. The same is true of *Melosira*, including *M. varians*, *M. nummuloides* and *M. subflexilis*, they often making up the bulk of many collections. *Epithemia turgida*, a fresh water form, is common in most of the gatherings, except from those near St. John, while *E. zebra* is more rare. Of the *Nitschias*, *N. bilobata* occurs at the foot of the Long Reach on the one hand and at Perry's Point on the other, as well as at Rothesay. *Nitschia closterium* occurs at the Milkish, Harris's and Saunderson's Coves, but has not been observed at points more remote from the sea. It is, however, a marine or brackish water species. *N. didyma* has been observed at Millidgeville and about the docks in St. John Harbor. *Pleurosigmas* are usually marine, and many species abound in the waters of the Bay of Fundy, but they are also not uncommon in those of the lower St. John and Kennebecasis, the most common perhaps being *P. attenuatum*, which is really a fresh water species. *Bacillaria paradoxa*, a brackish water species, was not only observed, in active movement, at Indiantown and in St. John Harbor, but up the St. John to the Nerepis and at Saunderson's Cove on the Kennebecasis. *Synedra ulna*, a fresh water form, is widely distributed.

On the other hand, as species of very limited distribution, so far as the area under discussion is concerned, and some of which would seem to be waifs from the ocean outside, may be

mentioned *Isthmia cneutris*, found in the plankton of the Narrows; *Triceratium alternans*, observed in Harris's Cove; *Rhabdonema minutum*, found in the Milkish and the Narrows, as well as in St. John Harbor; *Cymatopleura* and *Coscinodiscus*, of which specimens have been observed, but rarely, in collections from Harris's Cove, Millidgeville and Drury's Cove. The forms of the latter genus, as found inside the harbor, are all quite small.

The following tables show more fully the facts of distribution:

TABLE SHOWING DISTRIBUTION OF DIATOMS IN ST. JOHN RIVER AND KENNEBECASIS.

TABLE SHOWING DISTRIBUTION OF DIATOMS IN ST. JOHN RIVER AND KENNEBECASIS.—Continued

<i>Navicula maculata</i> .....	Marine
<i>Navicula didyma</i> .....	Marine
<i>Navicula distans</i> .....	Marine
<i>Nitschia scalaris</i> .....	Brackish
<i>Nitschia sigmaeoides</i> .....	Fresh
<i>Nitschia sigma</i> .....	Marine or brackish
<i>Nitschia bilobata</i> .....	Brackish
<i>Nitschia closterium</i> .....	Marine & brackish
<i>Nitschia</i> .....	.....
<i>Odontidium</i> .....	.....
<i>Pleurosigma</i> .....	.....
<i>Pleurosigma fasciola</i> .....	Marine
<i>Pleurosigma Balticum</i> .....	Brackish or marine
<i>Pleurosigma angulatum</i> .....	Brackish & marine
<i>Pleurosigma strigilis</i> .....	Brackish & marine
<i>Pleurosigma strigosum</i> .....	Brackish & marine
<i>Pleurosigma attenuatum</i> .....	Marine
<i>Rhabdonema</i> .....	Fresh
<i>Rhabdonema arcuatum</i> .....	.....
<i>Raphoneis Boeckii</i> .....	.....
<i>Raphoneis amphiceros</i> .....	.....
<i>Stauroneis</i> .....	.....
<i>Stauroneis phenicenteron</i> .....	.....
<i>Surirella splendida</i> .....	Fresh
<i>Surirella ovata</i> .....	Brackish
<i>Surirella ovalis</i> .....	Fresh
<i>Surirella biseriata</i> .....	Fresh
<i>Surirella gemma</i> .....	Marine
<i>Surirella striatula</i> .....	Marine or brackish

TABLE SHOWING DISTRIBUTION OF DIATOMS IN ST. JOHN RIVER AND KENNEBECASIS. —Continued.

	HABITAT
<i>Synedra arcus</i> .....	Marine
<i>Synedra ulna</i> .....	Fresh
<i>Synedra radians</i> .....	Fresh
<i>Synedra pulchella</i> .....	Fresh
<i>Tabellaria</i> .....	Fresh
<i>Tabellaria flocculosa</i> .....	Fresh
<i>Tabellaria fenestrata</i> .....	Brackish
<i>Tryblionella scutellum</i> .....	Brackish
<i>Tryblionella gracilis?</i> .....	Brackish
<i>Zygoceros</i> .....	Brackish
<i>Triceratium alternans</i> .....	Brackish
<i>Acanthas</i> .....	Brackish
<i>Acanthas longipes</i> .....	Brackish
<i>Acanthas brevipes</i> .....	Brackish
<i>Acanthas subseptilis</i> .....	Brackish
<i>Acanthas minuta</i> .....	Brackish
<i>Cymbella gastroides</i> .....	Brackish
<i>Harrte Cove</i> .....	
<i>Gregarby's Point</i> .....	
<i>Hardinge's Point</i> .....	
<i>Nerepis</i> .....	
<i>Malgeseide</i> .....	
<i>Mikkish</i> .....	
<i>Narrows—St. John</i> .....	
<i>Courtney Bay</i> .....	
<i>St. John Harbor</i> .....	
<i>Perry's Point</i> .....	
<i>Saunders's Cove</i> .....	
<i>Rothesey</i> .....	
<i>Milledgeville</i> .....	
<i>Burnt Island</i> .....	
<i>Dury's Cove</i> .....	

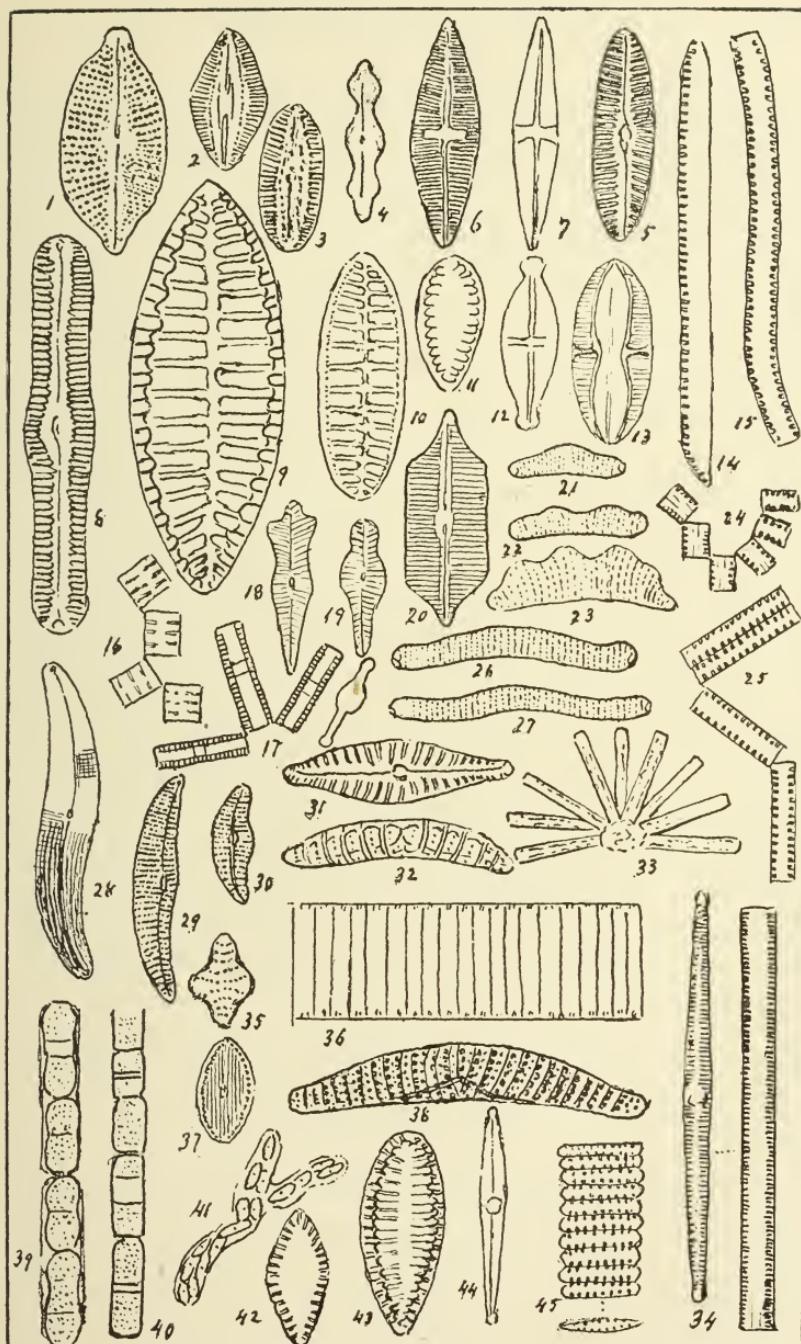
<i>Schizonema</i> .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
<i>Encyonema</i> .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
<i>Pinnularia</i> .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
<i>Pinnularia mesolepta</i> .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
<i>Pinnularia viridis</i> .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
<i>Pinnularia major</i> .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
<i>Pinnularia distans</i> .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
<i>Orthosira</i> .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
<i>Orthosira orichalcea</i> .†	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
<i>Orthosira marina</i> .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

Note.—The collections referred to in previous pages, so far as they relate to those of the St. John and Kennebecasis rivers, were made in connection with the work of the Marine Biological Station at St. Andrews, and with the assistance of Prof. A. P. Klugh of Queen's University, Kingston, Ont. For specimens of Infusorial earth I am indebted to Wm. Murdoch, Esq., C. E. of St. John, and Prof. W. F. Ganong.

## EXPLANATION OF PLATE.

The forms represented in the Plate are only rough sketches and are not drawn to scale. They make no claim to artistic merit; means of accurate representation, and especially of reproduction, not being available to the author. They are intended mainly to enable local students to identify at least the genera of the forms most commonly met with in the waters of New Brunswick. For more exact drawings of these and other species it will be necessary for the student to consult standard works. The figures given are as seen with a one-quarter inch objective, and the magnification is about 500.

1	<i>Navicula maculata</i>	24	<i>Diatoma vulgare</i>
2	<i>Navicula smithii</i>	25	<i>Diatoma elongatum</i>
3	<i>Navicula elliptica</i>	26	<i>Himantidium arcus</i>
4	<i>Navicula trinodis</i>	27	<i>Himantidium undulatum</i>
5	<i>Navicula viridis</i>	28	<i>Pleurosigma attenuatum</i>
6	<i>Stauroneis phoenicenteron</i>	29	<i>Cocconema lanceolatum</i>
7	<i>Stauroneis acuta</i>	30	<i>Cocconema cistula</i>
8	<i>Navicula nobilis</i>	31	<i>Cymbella gastrooides</i>
9	<i>Surirella biseriata</i>	32	<i>Epithemia zebra</i>
10	<i>Surirella gemma</i>	33	<i>Synedra radians</i>
11	<i>Surirella ovata</i>	34	<i>Synedra ulna</i>
12	<i>Stauroneis anceps</i>	35	<i>Fragillaria Harrisonii</i>
13	<i>Amphora ovalis</i>	36	<i>Fragillaria</i>
14	<i>Nitschia sigmoidea</i>	37	<i>Cocconeis Placentula</i>
15	<i>Nitschia sigmoidea</i>	37	<i>Epithemia turgida</i>
16	<i>Tabellaria flocculosa</i>	39	<i>Melosira subflexilis</i>
17	<i>Tabellaria fenestrata</i>	40	<i>Melosira varians</i>
19	<i>Gomphonema capitatum</i>	41	<i>Encyonema coespitosum</i>
18	<i>Gomphonema geminatum</i>		
20	<i>Navicula amphigampus</i>	42	<i>Surirella ovalis</i>
21	<i>Eunotia monodon</i>	43	<i>Surirella splendida</i>
22	<i>Eunotia diodon</i>	44	<i>Synedra pulchella</i>
23	<i>Eunotia tetraodon</i>	45	<i>Odontidium</i>



The occurrence of marine species at considerable distances from the sea,—for example that of *Triceratium alternans* fifteen miles from the mouth of the St. John at Harris's Cove, that of *Amphiprora alata* at Perry's Point and Ingleside, the former locality twelve miles and the latter fourteen miles from the sea, and further of *Biddulphia aurita*, *Coscinodiscus radiatus* and *Grammatophora marina* at Harris's Cove, along with *Surirella ovata*, *Navicula didyma* and *Tryblionella scutellum*.—is in accordance with facts observed elsewhere. Thus in the Hudson River, marine forms, mingled with those of fresh water types, are found in slightly brackish water, at least sixty miles from the mouth of the stream, while in Florida forms regarded as marine, and common on the Atlantic seaboard, were found by my father, the late Prof. J. W. Bailey, at Lake Munroe, two hundred miles from the mouth of the St. John's River. Similarly, in the Thames, in England, marine forms in large numbers are found at points at least fifty miles from the sea. The rapid and alternating currents which traverse the lower St. John as the result of exceptional tidal flow in the Bay of Fundy, must be especially favorable to the wide dispersion and commingling of their microscopic contents. The occasional finding of a Foraminifer and the occurrence at several points of the Infusorian *Distephanus speculum*, common in the Bay of Fundy, are further indications of the introduction of marine types into the waters of the lower St. John. Sponge *spicula* are common in nearly all the collections.

As bearing upon the question of distribution, discussed above, the following list of hydrographic observations in the lower St. John and Kennebecasis waters is appended:

#### HYDROGRAPHIC DATA ON DIATOM LOCALITIES.

Millidgeville	Surface	Temp. 51°	Sp. Gr. Surface	1.006	2 fath.	1.007
Hillhurst	"	" 53°	" "	1.006	2 "	1.006
Matthews Cove	"	" 53°.3	" "	1.005	1 "	1.006
Saunders Cove	"	" 53°	" "	1.005	10 "	1.006
Perry's Point	"	" 53°.9	" "	1.004	1 "	1.004

Rothesay	Surface Temp.	53°	Sp. Gr.	Surface	1.006	4 feet	1.006
Indiantown	"	49°	"	"	1.011	10 fathms.	1.012*
Land's End	"	52°	"	"	1.005	5 "	1.010†
Milkish	"	53°	"	"	1.002	2 "	1.004†
Gregory's Point	"	54°	"	"	1.000	5 "	1.010*
Gregory's Point	"	"	"	"	1.002	12 "	1.016†
Mouth of Nerepis	"	69°.8	"	"	1.000	2 "	1.001‡
Mouth of Nerepis	"	69°.8	"	"	1.000	2 "	1.000

It would appear from the above that the lowest temperature recorded, that at Indiantown, with the tide at half flood, is 49°, or 17° above the freezing point. This is only a little more than a mile above the Falls at the mouth of the river, and where there is a strong upward current from the sea. The temperature at the several points on the Kennebecasis varies but little from 53°, though, except at Saundier's Cove, the depth of observation did not exceed two fathoms. On the main St. John the surface temperature was nearly the same about Grand Bay and the Milkish, but rose to 54° at Gregory's Point and to 69.8 at the mouth of the Nerepis.

Taking the specific gravity of the water at the mouth of the Nerepis and somewhat removed from the main channel of the river as unity to the depth of two fathoms, we find that off Gregory's Point nearly opposite, but within the channel, also 1.000 at the surface, but 1.010 at a depth of five fathoms and 1.016 at the depth of twelve fathoms, both observations being on the flood. At the Land's End, three miles below, the surface density was 1.005 but at a depth of five fathoms 1.010, the same as at Gregory Point. Finally, at Indiantown, while the surface density was 1.011, that at ten fathoms was but little more, or 1.012. Thus it would appear that the density for some distance above the Falls, where the water is subject to powerful currents and frequent reversals of direction, is practically the same at all depths, but from the Milkish up a considerable difference is observed between the surface density and that of a depth of a few fathoms, the fresh water of the river evidently flowing over the saltier water brought in by the tide.

\* $\frac{1}{2}$  Flood.

† $\frac{3}{4}$  Flood.

‡Full Flood.

||Ebb.

Indications of differences of salinity, and decrease of the latter with increase of distance from the sea, are to be found not only by observations for density, but also through the effects of evaporation upon the slides used for microscopic examination. In the case of all those about the Narrows, the saline matter was such as to obscure observation, making repeated washings necessary, but this effect became less as the point of collection was more remote from the mouth of the river, and at the most remote points was barely perceptible. From the character of the crystallization it would also appear that the more soluble magnesian salts, together with sulphate of soda, have a wider distribution than common salt or sodium chloride. No chemical analyses of the water have yet been made.

#### THE "INFUSORIAL EARTHS" OR TRIPOLITES OF NEW BRUNSWICK.

These have as yet been observed at comparatively few points, but it is altogether probable that further search will reveal their presence at many other localities. They are usually found on the bottom of shallow ponds or small lakes or beneath beds of peat. They present the appearance of chalk-like deposits, sometimes of chalky whiteness and easily reducible to powder; in other instances colored grey by the presence of organic matter, or yellowish from the presence of hydrous peroxide of iron.

Such deposits are of some economic value and have been applied to a variety of uses, such as absorbents of nitro-glycerine in the manufacture of dynamite, as filling material in the making of paper, in the manufacture of soap and water-glass, as abrasive material in polishing powders, and for other uses. They are also of interest to the geologist, as from the character of the contained species it is possible to determine whether they are of purely lacustrine or marine origin, and therefore to indicate former changes of level in relation to the sea. It is possible that in some instances the lower layers of the

deposits may indicate deposition in salt water and the later in fresh, owing to elevation from conditions of marine submergence. Such changes will also have had their influence upon the characteristics of the contained species, and observations, indicative of such change, have already been made by the writer.

At present only four deposits of Tripolite or Infusorial Earth, as found in New Brunswick, are known to the writer, viz., (1) at Fitzgerald Lake, about seven miles from the city of St. John; (2) at Pollet Lake, in Mechanics Settlement, King's County; (3) on the Kingston peninsula about one mile east of its western extremity, and (4) in Gover Lake, at the head of the Upper North Branch of the Little S. W. Miramichi River. The species observed in these several localities are given below.

#### Diatoms from Fitzgerald Lake, St. John County

The deposit at this locality has been described by Dr. J. G. Baxter in the Proceedings of the Miramichi Natural History Association, No. III, 1908, where it is said to cover an area of about fifty acres, with a maximum depth of thirty feet. Dr. Baxter also gives a list of species, but in that which follows only those are included which have been identified either by myself or Mr. O. Kendall.

<i>Stauroneis phoenicenteron.</i>	<i>Gomphonema acuminatum.</i>
<i>Pinnularia major.</i>	<i>Stauroneis gracilis</i> Ehr.
<i>Pinnularia viridis</i> common.	<i>Synedra ulna.</i>
<i>Pinnularia nobilis</i> Ehr.	<i>Eunotia monodon</i> Ehr.
<i>Pinnularia dactylus</i> Kg.	<i>Eunotia major.</i>
<i>Surirella splendida.</i>	<i>Eunotia</i> n. sp!
<i>Surirella biseriata.</i>	<i>Fragillaria construens</i> Grun.
<i>Himantidium arcus.</i>	<i>Navicula Brebissonii</i> Kg.
<i>Cymbella cuspidata</i> Kg.	<i>Navicula firma</i> Kg.
<i>Cymbella gastroides</i> Kg.	<i>Navicula dilatata</i> Ehr.
<i>Cymbella heteropleura</i> Kg.	<i>Navicula ovalis.</i>
<i>Cocconeis disrupta</i> Greg.	<i>Navicula cuspidata.</i>
<i>Epithemia succincta.</i>	<i>Nitschia spectabilis</i> Ralfs.
<i>Gomphonema capitatum.</i>	<i>Tabellaria fenestrata.</i>

## Diatoms from pond on Kingston Peninsula, Kings Co.

Pinnularia viridis.	Surirella robusta var. diadema Ehr.
Pinnularia major.	Eunotia diadema.
Gomphonema acuminatum.	Eunotia major Rab.
Gomphonema geminatum.	Eunotia major var. robusta.
Stauroneis phoenicenteron.	Eunotia incisa Greg.
Himantidium gracile.	Navicula rhomboides.
Himantidium undulatum.	Navicula distans A. S.
Cymbella heteroplenia Ktz.	Navicula acrosphaenia Kg.
Cymbella gastrodes Ktz.	Navicula cuspidata Kg.
Cymbella Ehrenbergii.	Navicula discremens Kg.
Cyclotella Kuttingiana K.	Navicula tumescens Grun.
Tabellaria fenestrata Ktz.	Pinnularia nobilis Ehr.
Amphora ovalis Kutz.	Pinnularia gigas Kg.
Surirella biseriata?	Synedra ulna var. vitrea V. H.
Surirella robusta.	Synedra biceps Kutz.

## Diatoms from Pollet Lake, Mechanics Settlement, Kings Co., N. B.

Navicula rhomboides.	Nitschia spectabilis Ralfs.
Navicula ovalis.	Nitschia linearis?
Navicula binodis.	Himantidium gracile.
Navicula trinodis.	Himantidium arcus.
Navicula dilatata Schm. At.	Himantidium undulatum.
Navicula Brebissonii Kg.	Cocconeema Cistula.
Navicula cuspidata Kg.	Cocconeema lanceolatum Ehr.
Navicula (Pinnularia) major W. Sm.	Cymbella gastrodes Ktz.
Navicula (Pinnularia) viridis W. S.	Cymbella cuspidata Ehr.
Navicula (Pinnularia) nobilis.	Cyclotella striata Grun.
Navicula (Pinnularia) dactylus.	Cyclotella compta Kg.
Stauroneis phoenicenteron Ehr.	Eunotia major Rab.
Surirella splendida Ehr.	Eunotia pectinalis Kg.
Surirella biseriata W. S.	Eunotia pectinalis var. stricta.
Epithemia.	Eunotia diadema.
Gomphonema acuminatum Ehr.	Eunotia tetraodon.
Gomphonema capitatum.	Synedra sp? sigmoid.
Gomphonema constrictum Ehr.	

Of the species above enumerated all are distinctly fresh water forms, though varieties of *N. ovalis* occur in the brackish waters of the lower St. John. They are also all of existing forms, though the living Diatoms of the lake have not yet been

determined. The deposits at this locality are remarkable for their purity and whiteness, though owing to the presence of an apparently silicious cement, they are difficult to separate and clean. The locality in which they are found is probably nearly 1,000 feet above the sea, and the lake bottom occupies an area of 122 acres, now laid bare by draining. The depth of the Tripolite varies from 8 to 16 feet. Probably 50 acres of it are from 15 to 16 feet deep. The upper portion to a depth of 3 to 12 inches is of a gray colour, soft and mushy with some vegetable fibres, while below this the material is sufficiently firm for horses to walk upon it though possessing a springy character suggestive of rubber. This portion is pure white and destitute of fibres.

Diatoms from Gover Lake, North Branch of the Little S. W. Miramichi.

<i>Stauroneis phoenicenteron.</i>	<i>Navicula.</i>
<i>Stauroneis anceps.</i>	<i>Navicula amphigampus.</i>
<i>Pinnularia viridis.</i>	<i>Navicula elegans?</i>
<i>Pinnularia major.</i>	<i>Navicula ovalis.</i>
<i>Pinnularia mesolepta.</i>	<i>Melosira aurichalcea.</i>
<i>Eunotia monodon.</i>	<i>Surirella ovata? frag.</i>
<i>Eunotia diodon.</i>	<i>Coccconeis.</i>
<i>Eunotia tetraodon.</i>	<i>Epithemia Argus.</i>
<i>Himantidium gracile.</i>	<i>Epithemia alpestris?</i>
<i>Himantidium undulatum.</i>	<i>Gomphonema capitatum.</i>
<i>Tabellaria flocculosa.</i>	<i>Encyonema.</i>
<i>Tabellaria fenestrata.</i>	<i>Cocconeema lanceolatum.</i>
<i>Cymbella Ehrenbergii.</i>	<i>Cocconeema Cistula.</i>
<i>Cymbella cupidata.</i>	<i>Synedra ulna.</i>
<i>Navicula binodis?</i>	<i>Fragillaria Harrisonii.</i>

Since the foregoing article was put in type collections have been made from two additional localities, both of purely fresh water character.

Diatoms from Lawlor's Lake, St. John County:

<i>Cocconema lanceolatum</i> Ehr.	<i>Epithemia turgida</i> W. Sm.
<i>Cocconema cistula</i> Ehr.	<i>Epithemia zebra</i> Ehr.
<i>Himantidium undulatum</i> W. Sm	<i>Encyonema coespitosum</i>
<i>Himantidium arcus</i> W. Sm.	<i>Synedra ulna</i> Ehr.
<i>Himantidium gracile</i> Ehr.	<i>Stauroneis phoenicenteron</i> Ehr.
<i>Cyclotella Kutzngiana</i> Thw.	<i>Pleurosigma attenuatum</i> W. Sm.
<i>Navicula (Pinnularia) viridis</i> W. S.	<i>Tabellaria flocculosa</i> Kutz.
<i>Navicula (Pinnularia) major</i> W.S.	<i>Nitschia scalaris?</i> W. Sm.
<i>Cymbella gastrodes</i> Kg.	

Diatoms from Otnabog Lake, Queens County:

<i>Cocconeis placentula</i>	<i>Cymatopleura solea</i>
<i>Navicula viridis</i> W.S.	<i>Himantidium gracile</i> Ehr.
<i>Navicula elliptica</i> (Smithii).	<i>Himantidium undulatum</i> W Sm.
<i>Navicula nobilis</i> Ehr.	<i>Pleurosigma attenuatum</i> W. Sm.
<i>Navicula radios? Kg</i>	<i>Orthosira orichalcea</i> W. Sm
<i>Epithemia turgida</i> W. Sm.	<i>Nitschia sigmaoidea</i> W. Sm.
<i>Epithemia zebra</i> Ehr.	<i>Nitschia bilobata</i> W. Sm.
<i>Tabellaria fenestrata</i> Kutz.	<i>Surirella elegans</i> Ehr
<i>Tabellaria flocculosa</i> Kutz.	<i>Surirella intermedia</i>
<i>Gomphonema constrictum</i> Ehr.	<i>Surirella splendida</i> Kutz.
<i>Gomphonema geminatum</i> Ag.	<i>Cocconema lanceolatum</i> Ehr.
<i>Stauroneis phoenicenteron</i> Ehr.	<i>Cocconema cistula</i> Ehr.
<i>Stauroneis anceps</i> Ehr.	<i>Synedra ulna</i> Ehr.
<i>Stauroneis acuta</i>	<i>Cyclotella Meneghiniana</i> Kg.
<i>Tryblionella</i>	<i>Cyclotella compta.</i>
<i>Campylodiscus (costatus?)</i> N. S.	<i>Stephanodiscus Niagarae</i> Ehr.

Otnabog Lake is about thirty-nine miles distant from the outlet of the St. John river and about twenty-seven from the mouth of the Nerepis. It is separated from the main channel of the St. John only by a narrow strip of intervalle, which is submerged during freshets. It is subject to a slight rise and fall due to backing up of the water through the change of tide at the mouth of the river, but no salinity is evident to the taste. The only species which would seem to suggest the influence of salt water is *Nitschia bilobata*, which is described by Smith as brackish. It is not probable that any marine or brackish water forms would be found in the main St. John above this point.

## ARTICLE II.

### NOTES ON THE NATURAL HISTORY AND PHYSIOGRAPHY OF NEW BRUNSWICK.

BY W. F. GANONG.

#### 120.—ON THE PHYSICAL GEOGRAPHY OF BARTHOLOMEW RIVER

Read by Title May 2, 1911.

*(The map to accompany this note will be included with one of the Dungarvon River in the next Bulletin.)*

Of the several great branches which run parallel with the Main Southwest Miramichi in the carboniferous country, the one which lies nearest on the north, and is the smallest, is Bartholomew River. In July last I descended it in a canoe from near its source in the South Branch to its mouth, making observations upon its physical geography with results which follow.\*

The development of our knowledge of the river can be briefly traced. Its very first appearance of any kind in records, so far as I can discover, is in 1809, when it is mentioned in its present form in one of the Land Memorials preserved at Fredericton. It is shown for the first time on a map upon Bonnor's Map of New Brunswick of 1820. Its name is derived without doubt, as Cooney† has told us, from that of an

\*I was accompanied by my friend Mr. S. A. R. MacDonald, of Fredericton. We went in by the portage road, via Pleasant Ridge, though we afterwards found that it would have been much better to go by way of Ludlow. Though the water was fairly high we had to drag the canoe a good deal on the upper waters, but found the lower parts easy and pleasant canoeing.

†In his *History of Northern New Brunswick and Gaspe*, 1832, page 24. The local pronunciation is like Bartholomee or Bartholemees. The local nomenclature of the river is of simple and mostly obvious origin. An exception is the word *Mohang*, applied to the deep pool on McCaskill Brook just above its junction with the Bartholomew, a word which is said to be of Indian origin. Though named Bartholomews on most maps, locally the river is mostly called Bartholomew.

Indian family which formerly possessed, *i. e.*, lived or hunted, upon it. It has never been surveyed, and our present maps are pieced together from various sketches made in connection with timber line surveys. It has not been studied by geologists, though Chalmers has a mention of a remarkable gravel ridge on the south side (*Report of the Geological Survey of Canada*, 1895, 86 M) which he also shows, with some few other facts about the lowermost part, upon his Surface Geology map. It has been settled for a short distance up its course by settlers expanding from the Miramichi, mostly Irish, but with some Scotch and a few English, although, as in the case of all other rivers in this region, the settlement is contracting.\* Above the old farms it is one unbroken forest, which has furnished immense quantities of lumber. Indeed the river is locally noted for the very rapid re-growth of lumber upon it, and it has never been badly burnt. It is rather a poor stream for fish, the dam at Blackville interposing an effective barrier to the ascent of salmon, while trout are only moderately plenty; nor has it any special reputation for game. Hardly any literature of any kind in connection with it appears to exist.†

Bartholomew River, as the map will show, has two sources in branches of nearly equal size. The North Branch I have seen only at its mouth, but it is said to run in a flat country, and to have two or three large deadwaters, one almost large enough to be called a lake, upon it. The South Branch rises in a little lake, which I have seen, a typical shallow lake of the flat country, with a low ridge on the south and extensive bog on the north.‡ Thence a small stream runs for a mile or two down to a large deadwater, in an open flat country. This deadwater, which is about a mile in length, is partially formed by a large dam, and is sometimes called "The Lake,"

\*A good deal of information about these settlers, which I expect later to publish in another connection, along with other information about the river, has been given me by the very obliging postmaster of Bartholomew, Mr. Stephen McCarthy.

†I have noted only a single reference to the river in sporting literature—an article describing a hunting trip to its headwaters in *Forest and Stream*, Sept. 21, 1907, 455.

‡This is obviously the lake meant by Cooney (*Op. cit.*, 121) when he says "The Bartholomew emerges from a beautiful lake near Porter's Brook." Its remoteness at that day had evidently operated to magnify its charms.

thus making confusion possible (and in our case, actual) with the real lake at the source. Thence I have seen the river to its mouth. It issues from the deadwater as a dark brown stream running rapidly down a broad bed mostly over slate ledges, in a valley cut some thirty or forty feet below a flat country. Thus it continues for a mile or so, a grievous trial to the canoeman, when it gradually becomes quieter, narrower and deeper, and merges to a stillwater stream with sand-bottomed and meadow-bordered pools. After a mile or more it becomes shoal and rocky again, and soon after passes abruptly from the slate country into that of the typical carboniferous gray sandstones which show first in low cliffs on the left bank. The red sandstones and conglomerates of the Lower Carboniferous, which usually lie between the slates and gray sandstones, appear to be wanting upon this river as upon the Dungarvon, a fact correctly represented for the latter river by the Geological Survey map, but erroneously for the Bartholomew. The river continues rocky for a time, with frequent flat sandstone bottom, and occasional low cliffs, but gradually merges into a deeper stillwater stream with meadowy banks, and continues thus down to the Forks, where the North Branch enters as a somewhat smaller and clearer stream. Just below is a large dam covering a former small fall at sandstone ledges.

Below the dam the river is stony and shallow for half a mile, then gradually grows quieter and deeper, developing shallow stillwater pools interspersed with short rips and small stony reaches, and with flat sandstone bottom, the banks being mostly meadowy and alderly, with occasional banks of gravel and sandstone, all in a flat, densely forested country. At Dungarvon Turns (apparently simply a place where the river turns up towards Dungarvon, and a portage road runs across), the sandstone cliffs are about 15 feet high and the country along the portage road about 30 or 40 feet above the river. Farther down the river keeps the same general characteristics with a tendency to become steadily quieter and deeper, winding much more than the map implies, and developing into a very easy and pleasing canoe stream. Such is its char-

acter down to the uppermost old settlement a few miles above Ledbetters Brook. Farther downward the river becomes still larger, quieter, and more open, with the country gradually rising, although the valley of the river remains ever open, mature and trough-like. It is a decidedly pretty stream, though rather monotonously so, and the forests are everywhere unbroken and unburnt. And thus it continues down to the long deadwater made by the Blackville Dam and to the settlement, where the country rises gently some hundred feet above the river.

Summarizing the characteristics of the river as a whole, its most notable feature is its singular homogeneity of character, and its consequent lack of any striking features of any kind. It has a remarkably even slope, regularly decreasing from its source downward.

We turn now to the probable physiographic evolution of the river. So scant is the relief of the country in which it flows that it is impossible to tell from the river anything more than the maps suggest, and almost anything they suggest may be possible. Its parallelism with the Main Southwest and the Dungarvon, between which it lies, implies, of course, a history identical with theirs as part of the remarkable Northumbrian system, already discussed in these Notes (No. 93). Its extremely wide open and mature-looking character, however, suggests very strongly that it may once have been the outlet of a much larger river. And this fact correlates very well with the curious alignment of the stream with the Main Southwest Miramichi above Fall Brook, suggesting that it may once have been the outlet of some part or tributary of that river. Indeed, I think it not beyond possibility that Burnt Hill Brook may once have had a course by way of McBeans Brook and the lower part of Salmon Brook into the south branch of Bartholomew, in which case the Clearwater may have flowed by way of Gilman Brook and the present main river to Fall Brook, and thence across to the North Branch or perhaps the Dungarvon. Other possible connections, of minor importance, are suggested by the map, including a con-

nection of the upper waters with the Dungarvon through Dungarvon Lake, with the upper part of Big Hole Brook through Davis Landing Brook, and especially with the Main Southwest through Otter Brook, which comes curiously close to the main river and is in partial alignment therewith. But the reality of such connections must await more thorough studies in the future, and especially the construction of accurate topographical maps. There is no question, however, I believe, that the lower course of Bartholomews and the main Miramichi below it occupy a single continuous valley, precisely as suggested in the earlier interpretation of these rivers in the note on the Northumbrian system.

#### 121.—A PRELIMINARY STUDY OF THE SAXBY GALE.

Read by Title May 2, 1911.

All New Brunswickers have heard about the Saxby Gale; many remember it; some can still point to visible evidences of its destructive power; but it is surprising how little exact information about it one can gather in the province, while, as is usual in such cases, a kind of a conventionalized Saxby Gale legend is slowly evolving. I have tried to gather the essential facts about it for record in the Society's Bulletin, and may add that the desirability of so doing was first suggested to me by another of our New Brunswickers interested in the natural phenomena of the Province, Mr. J. W. Bailey.

*First, as to its date.* All testimony agrees that it occurred upon October 4, 1869, beginning in the late afternoon, culminating in the evening, and blowing itself out before morning.

*Second, as to its extent.* On seeking to gather data upon this point, I experienced a decided surprise, tinged with some little sense of affront to my local pride, when I found in answer to my search and inquiries that our famous gale seemed not to receive mention in any meteorological books and to be quite unknown to the principal authorities of the Weather Bureau at Washington. Furthermore it is not mentioned at all in a book on the Historic Storms of New England from 1635

to 1890.\* The implication from these sources that the gale was very local is confirmed also from other sources. Our colleague, Dr. G. F. Matthew, writes me:—

A heavy southwest gale struck us in the Maritime Provinces, causing much destruction, and a very high tide in the Bay of Fundy. The worst effects of the gale were felt in Charlotte and York counties, across which it swept diagonally.

A series of extracts from contemporary newspapers, kindly sent me through Professor Cleveland Abbe of the Weather Bureau at Washington, shows that in Nova Scotia its effects were very severe along the Bay of Fundy, though it did no great damage along the Atlantic coast of that Province. In general, therefore, we may summarize its extent by saying that it was a local southwest gale which attained its maximum of violence in New Brunswick and Nova Scotia, especially centering in the Bay of Fundy.

*Third, as to its violence, and the damage it did.* That this gale attained a violence altogether unusual is the universal testimony, though I have not found the actual meteorological records. These will, no doubt, be given in the article later mentioned, to be published by Mr. D. L. Hutchinson. As typical of its effects I may quote from a letter written me by one of the Society's most accurate observers, Mr. James Vroom, of St. Stephen:—

Next morning . . . . I went up through Milltown and back through Calais on a tour of inspection, and counted upwards of thirty buildings blown down, unroofed, or otherwise more or less injured by the gale. Among the buildings blown down was the Universalist Church at Milltown, N. B.; and it was in that storm that Christ Church, (St. Stephen), lost its tower. The storm was at its height about eight o'clock in the evening . . . . I heard the church bell rung by the swaying of the tower, and we looked out just in time to see the tower fall. A day or two later I went back to St. John by stage; and I have a very vivid recollection of the journey. We were frequently stopped by windfalls, and obliged to cut a way through. Of course we saw many trees and buildings blown down all along the route; but the extreme force of the wind seemed to have been felt in comparatively narrow strips, where, for perhaps a quarter of a mile or more in width, there

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\*According to *The Naturalist of the Saint Croix*, Bangor, 1903 57.

would be no trees standing. A blacksmith shop stood just at the turn of the road at the head of Oak Bay. Its roof was lifted and laid across the telegraph wires, apparently without breaking the wires, though they were borne to the ground beneath it. . . . There were many curious stories of the wind's freaks. . . . Perhaps the most remarkable circumstance was that with all the buildings destroyed, though there were many narrow escapes, not a human life was lost on land.

Again, in further illustration of the same subject, one of my most valued, observant and interested correspondents, Mr. P. H. Welch, of Fulton Brook, Queens County, writes me thus:—

I remember it well. The afternoon was cloudy, of a uniform gray, and towards sundown it began to blow quite strong, increasing to a stiff gale just after dark. The wind kept up a steady pressure, no gusts, and a sweeping roar like the fall of Niagara. I saw it pick up a heavy farm wagon and hurl it one hundred feet or more. It seemed to come from the southwest at first, but judging from the wreck it threw about it seemed to come more from the southeast. It threw fences all over acres of land. . . . I had good opportunity to see its effects in the destruction of the forests, as it blew down acres of woods, not leaving a single tree, and the larger the growth the more the damage, but always in isolated patches, from two to a hundred and fifty acres, which can plainly be traced yet as the Saxby blow-downs. I remember well starting with a crew to the lumber woods a week or so later, and it took us five days with six men and a team to clear out four and a half miles of portage. I saw where it broke off hemlock trees two and a half feet through, and sound, and threw their butts around in a half circle, and some were taken by the roots several feet with a ton of clay adhering to them. It blew down and unroofed many buildings, and in other cases left not a single shingle on them.

Our colleague, Dr. G. U. Hay, has also written me vividly his recollection of the fury of the gale, which he experienced while visiting his home at Norton.

Fortunately we possess also an account of the gale written at the time by an experienced observer. The late George A. Boardman, the ornithologist, on October 14, only ten days after the gale, described it thus in a letter to Spencer F. Baird, of Washington:—

Nothing like it ever took place here. It appeared like a whirlwind. . . . The Universalist church was a perfect wreck; the railroad bridge over the falls in front of my house fell into the river; also the covered

bridge at Baring. More than one hundred buildings in St. Stephen were ruined, and in our cemetery more than one thousand trees were uprooted and broken. At Eastport about forty buildings were destroyed or unroofed, several lives lost, and most all the fishing crafts were wrecked. At Eastport and St. Andrews and about the islands the tide was very high and damaged the wharves much. Sixty-seven vessels were ashore. . . . The blow did not last but about an hour and was heaviest at eight o'clock in the evening. There was very little wind at Bangor and not much at St. John. (*The Naturalist of the Saint Croix*, 57.)

And in a letter to Professor Baird written October 29 of the same year he gives this additional information:—

The great loss to this country from the Saxby gale will be to the woods. We have had some of our men up exploring and they say they can walk ten miles at a time on the trees that are down without stepping on the ground. In some places for half a mile about every tree is down. . . . The wind did not reach very far up the river, only about thirty or forty miles—it was the heaviest about the shores.

The accounts in the contemporary New Brunswick newspapers must also give reports of the greatest interest and value, and I am pleased to learn that these are being collected by our meteorological colleague, Mr. D. L. Hutchinson, and are to be published soon in a meteorological journal.

The damage done by the gale included not only great devastation in the forests, and a considerable destruction of buildings, but many wrecks in the Bay of Fundy, involving some loss of life. Happening to conjoin with a time of high tides, its course up the Bay of Fundy drove the tide to an unprecedented height, and thus caused the submergence of wharves and overflow of the dyked lands, with great destruction of dykes, cultivated marsh, and cattle. Thus the newspaper accounts above-mentioned referring to Wolfville, N. S., say: "Highest tide ever known, . . . . a large number of horses and sheep destroyed;" at Windsor "streets were flooded and the Green dyke was covered with mud;" in the same vicinity "the damage done to the dykes would amount to \$6,000. The tide rose from 12 inches to 18 inches higher than ever known before. The Grand Pre and Wickwire dykes in Horton were completely submerged." The residents of the country of

the dykes and marshes, around both Minas Basin and Cumberland Basin, still recall the great tide, and the destruction of their dykes thereby.

*Fourth, as to the origin of the name.* It is popularly known that the gale was named for a person by whom it was predicted; and it is believed in New Brunswick that the prediction, because of its exact fulfilment, was a very wonderful performance. Few, however, can give any definite idea of who Saxby was, nor do the biographical dictionaries yield any enlightenment; and it is only through the kind interest and aid of Professor Cleveland Abbe that I have been able to obtain any accurate information about him. Professor Abbe sends me a letter from W. H. Shaw of the Meteorological Office of South Kensington, London, which reads as follows:—

Saxby was an instructor of Naval Engineers who believed firmly in the lunar influence on weather and was bold enough to write a book in defence of his predictions, the second edition of which was issued by Longman, Green & Company in 1864. In the book he gives a list of weather warnings up to January 1st, 1866. He appears also to have issued an annual weather table, a copy of which for 1878 is in the Office Library. As there are four or five days in every month, separated by intervals of about seven days, on which changes are predicted, and three or four days on which intense disturbances are to be expected, it would be surprising if no coincidences with fact were found.

Saxby is commonly said to have been a lieutenant of the Royal Navy, which would seem to be confirmed by his position as Instructor of Naval Engineers. But Professor Abbe informs me that his book above mentioned gives his name simply as *S. M. Saxby, Esq., Royal Navy.* Apparently, though connected with the Navy he was not an officer, for in response to my inquiry made to the Admiralty office at London concerning him, I have received the following reply:—

The Secretary of the Admiralty presents his compliments to Professor W. F. Ganong, and in reply to his letter of the 10th inst., begs to inform him that there is no trace of a Lieutenant of the name Saxby having served in the Royal Navy at the date mentioned.

I have not been able to find any printed statement of Saxby's prediction of our gale, but I infer from statements

sent me by Dr. Matthew, and from some other evidence, that his prediction was not at all for a storm in our part of the world, but a great storm somewhere else; and our very local though severe disturbance happened to coincide with his date. The fulfilment of his prediction, therefore, is purely a coincidence, for which the prophet receives in our provinces an honor which was not his due, and which I understand was not accorded him in his own country.

#### 122.—ON THE DURATION OF OPEN WATER ON THE SAINT JOHN RIVER.

The length of time the Saint John River is free of ice each year is a matter of considerable interest not only practically but also scientifically. The newspapers are accustomed to publish, at seasonable times, tables of the dates of opening and closing of navigation; but these tables are copied from preceding lists without special correction, and nowhere is there accessible a table of these dates corrected to form a standard, and available for scientific purposes. As a basis for such a standard and reliable list I present herewith a table copied from the *Fredericton Gleaner* of April 15, 1911, with the intention of endeavoring to correct it, from old newspapers and other sources, for a later edition, and with the invitation to members of this Society to aid therein. I publish it precisely as given by the *Gleaner*, because, while some of the figures are inconsistent and therefore involve some error, I have no means as yet of knowing whether in such cases it is the date or the number of days which is misprinted. I would also suggest that for the future, the correct dates from year to year should be added by Mr. D. L. Hutchinson to his admirable meteorological tables published annually in the Society's Bulletin.

## Dates of Opening and Closing of St. John River to Navigation, 1825 to 1910.

Year	Date of Opening	Date of Closing	No. of Days Open	Year	Date of Opening	Date of Closing	No. of Days Open
1825	April 15	Nov. 20	219	1868	April 22	Nov. 16	208
1826	April 17	Nov. 14	211	1869	April 20	Nov. 26	220
1827	April 6	Dec. 3	241	1870	April 11	Nov. 22	223
1828	April 20	Nov. 19	213	1871	April 10	Nov. 24	227
1829	April 17	Nov. 15	212	1872	April 22	Nov. 29	221
1830	April 18	Nov. 29	226	1873	April 23	Nov. 12	203
1831	April 10	Dec. 1	235	1874	April 21	Nov. 22	214
1832	May 3	Nov. 15	196	1875	April 27	Nov. 19	206
1833	April 10	Nov. 5	219	1876	April 22	Nov. 30	222
1834	April 11	Nov. 17	220	1877	April 13	Dec. 4	235
1835	May 1	Nov. 23	206	1878	April 5	Dec. 18	247
1836	April 28	Nov. 19	205	1879	April 27	Nov. 22	209
1837	April 17	Nov. 9	206	1880	April 22	Nov. 21	212
1838	May 1	Nov. 25	208	1881	April 2	Nov. 22	234
1839	April 25	Nov. 23	236	1882	May 1	Nov. 26	209
1840	April 16	Nov. 23	221	1883	April 18	Nov. 15	216
1841	April 27	Nov. 27	214	1884	April 16	Nov. 19	217
1842	April 24	Nov. 22	212	1885	April 23	Nov. 27	218
1843	April 26	Nov. 14	202	1886	April 21	Nov. 23	216
1844	April 14	Nov. 27	227	1887	April 27	Dec. 1	217
1845	April 23	Dec. 4	225	1888	April 26	Nov. 21	209
1846	April 6	Nov. 28	236	1889	April 16	Dec. 1	228
1847	May 2	Nov. 20	223	1890	April 21	Nov. 24	217
1848	April 19	Nov. 13	208	1891	April 14	Nov. 29	229
1849	April 8	Dec. 2	239	1892	April 15	Dec. 6	234
1850	May 2	Nov. 27	209	1893	April 14	Nov. 21	220
1851	April 16	Nov. 17	215	1894	April 21	Nov. 20	212
1852	April 26	Nov. 25	220	1895	April 19	Nov. 22	216
1853	April 17	Nov. 25	221	1896	April 18	Nov. 21	210
1854	May 7	Nov. 10	208	1897	April 21	Nov. 21	213
1855	April 28	Nov. 22	218	1898	April 20	Dec. 9	232
1856	April 25	Nov. 17	215	1899	April 26	Nov. 13	202
1857	April 18	Dec. 5	230	1900	April 21	Nov. 20	213
1858	April 22	Nov. 13	204	1901	April 17	Nov. 24	221
1859	April 16	Nov. 29	226	1902	Mar. 23	Nov. 29	250
1860	April 23	Nov. 27	217	1903	Mar. 24	Nov. 27	247
1861	April 20	Dec. 3	230	1904	April 25	Nov. 10	220
1862	April 18	Dec. 3	229	1905	April 20	Nov. 21	215
1863	April 22	Nov. 17	209	1906	April 15	Nov. 26	225
1864	April 20	Dec. 9	232	1907	April 17	Nov. 20	211
1865	April 6	Nov. 10	233	1908	April 21	Nov. 23	216
1866	April 14	Dec. 12	242	1909	April 19	Nov. 30	225
1867	April 22	Nov. 17	209	1910	April 6	Nov. 29	234

Of course the feature of most immediate scientific interest in this table concerns its possible testimony as to changes or fluctuations in climate. With this in view, I have carefully plotted these dates in parallel graphs, hoping that some general fact or principle might thereby stand revealed. Nothing very positive, however, has resulted, and the possible inferences are vitiated by the probable errors of the table, which are of two sorts:—first, misprints in figures, and second, a possible or probable difference of method at different periods in deciding upon what constitutes the opening or closing of navigation. Thus, the arrival of the first steamboat appears to be taken usually as marking the opening of navigation, but it is quite likely that competition of competing lines, or other conditions of traffic, differing at different periods, might lead to a prompter pursuit of the ice by the steamers in some periods than others; and the date of closing is even more liable to such variations. Besides, the ice often moves after once having closed the river, thus allowing another possible difference in method of computation.\* Nevertheless, despite its errors the list has its value, which will increase with time and any corrections that can be made therein.

While I can find in the graphs and figures no basis for any generalization of importance, they do show two facts. First, the average time the river is open is a little longer in the second than in the first half of the list; and second, the earliest dates of opening and latest dates of closing of navigation fall in the later years. This slight indication of some amelioration of climate, however, may be vitiated by some of the errors mentioned, or even may be simply an accidental accompaniment of the smallness of number of the figures.

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\*These later movements of the ice are recorded in the table given for the years 1825 to 1849 in the New Brunswick Almanac for 1850, prepared by the Fredericton Athenaeum, page 125.

123.—ON THE PHYSIOGRAPHIC CHARACTERISTICS OF THE  
RENOUS LAKES.

Read by Title, May 2nd, 1911.

The lakes of New Brunswick fall rather naturally into somewhat definite groups determined, of course, by physiographic causes. Most of the groups I have studied, and last summer in August, I was able to visit and observe another, to the investigation of which I had long looked forward as likely to yield information of unusual interest. This is the group of some twenty lakes, lying in a remote wilderness country at the head of the two South Branches of the Renous River.\*

These lakes make no early appearance in records, as is to be expected from their remoteness and difficulty of access. Long Lake was crossed by a timber line of Jouett's in 1837, while Berton Lake and those below it appeared for the first time, though without names, on Berton's survey plan of the Renous River in 1838. Later surveys, by Jack, Fish and others, added sketches of several other lakes, as their plans, preserved in the Crown Land Office, show; and of course all of their data are incorporated into the accompanying map, with, however, some corrections as well as additions. No naturalist or geologist has heretofore visited the group, (the coloring on the Geological map having been added simply from estimation), nor have I been able to find any other references in print to the group aside from a brief mention in one of my own earlier notes (No. 85; *Bulletin*, No. XXIII, 316, 318), a brief reference by Dashwood, who visited them in 1863 (*Chiploquorgan*, 110), and the very interesting story by Risteen mentioned in a footnote below. The country has yielded a good deal of lumber, and now is visited each autumn by sportsmen in pursuit of moose, which are abundant, as are beaver and other game animals.

\*I was accompanied only by my friend Professor A. H. Pierce. We went on foot, carrying our own supplies from our camp below Upper Falls of the Dungarvon (see a Note on this River in the next *Bulletin*), to Berton Lake, whence we made three trips to the other lakes. The expedition took in all about nine days.

In preparing this paper, and the accompanying map, I have had much valued help from Mr. Henry Braithwaite, the well known leader of all New Brunswick guides, who trapped and surveyed in the region of the lakes in the seventies, and from Mr. Hiram Mandeville, of Derby, N. B., who guides sportsmen to the lakes on the Little South Branch.

We consider first the lakes of the Main South Branch. At the very source lies Louis Lake, one of the prettiest of all New Brunswick lakes, with clear, deep, spring-fed water, shores of rock and sand, and a border of low hardwood ridges.\* Not only is this lake one of the most attractive in New Brunswick, but it is the most elevated of which any measurement has yet been made, lying as it does (a mean of two observations) at 1745 feet above sea level.† It obviously lies close up to the summit of the plateau, for one has to go but a short way over a few feet of rise to the west to find Half Moon Lake, a shallow bog-bordered lake cut nearly in two by a stony bar, from which lake a stream flows down a great slope into the Dungarvon; while a little to the north lie the Mud Lakes, amply described by their name, some fifty feet (by estimation) higher, which empty to the northward down an immense slope into North Branch Renous waters as shown by the map. The Louis Lake stream I have not seen down to Long Lake, but it is said to have no lakes, and must fall greatly, since Long Lake, a bent lake with stony shores, lies some 250 feet lower. The stream then falls greatly among immense boulders, deep down amongst which it is sometimes completely out of sight. It receives the waters of Young Bull Lake — a pretty lake high up on the plateau — and passing through the shallow Mud Lake, and the pretty Grassy Lake, deep-set under Shunabit Mountain, enters Berton Lake. All of this stream has an aspect of newness which, in conjunction with its crookedness, makes it apparent that the valley is not an old one, but merely a recent overflow through chance channels from the top of the plateau.

The lakes on the South Branch,— Berton, Nealis and Fowler,— are insignificant lakes, shallow and margined by bog or boulders, and made much larger than the original deadwaters

\*A very appreciative account of this lake, and its beauties, centering around an amusing hunting experience, is given by F. H. Risteen in *Outing* XXXVI, 1900, 36.

†Determined, with the other heights given on the map, by aneroid measurements made during our visit. Although the usual precautions, described in earlier Notes, were taken to ensure accuracy, the fact that in most cases we could make very few observations at each place renders the figures less reliable than those given in many of the earlier Notes.<sup>1</sup>

As to other lakes of lofty elevation in the Province, compare Note No. 86, *Bulletin* No. XXIII, 325.

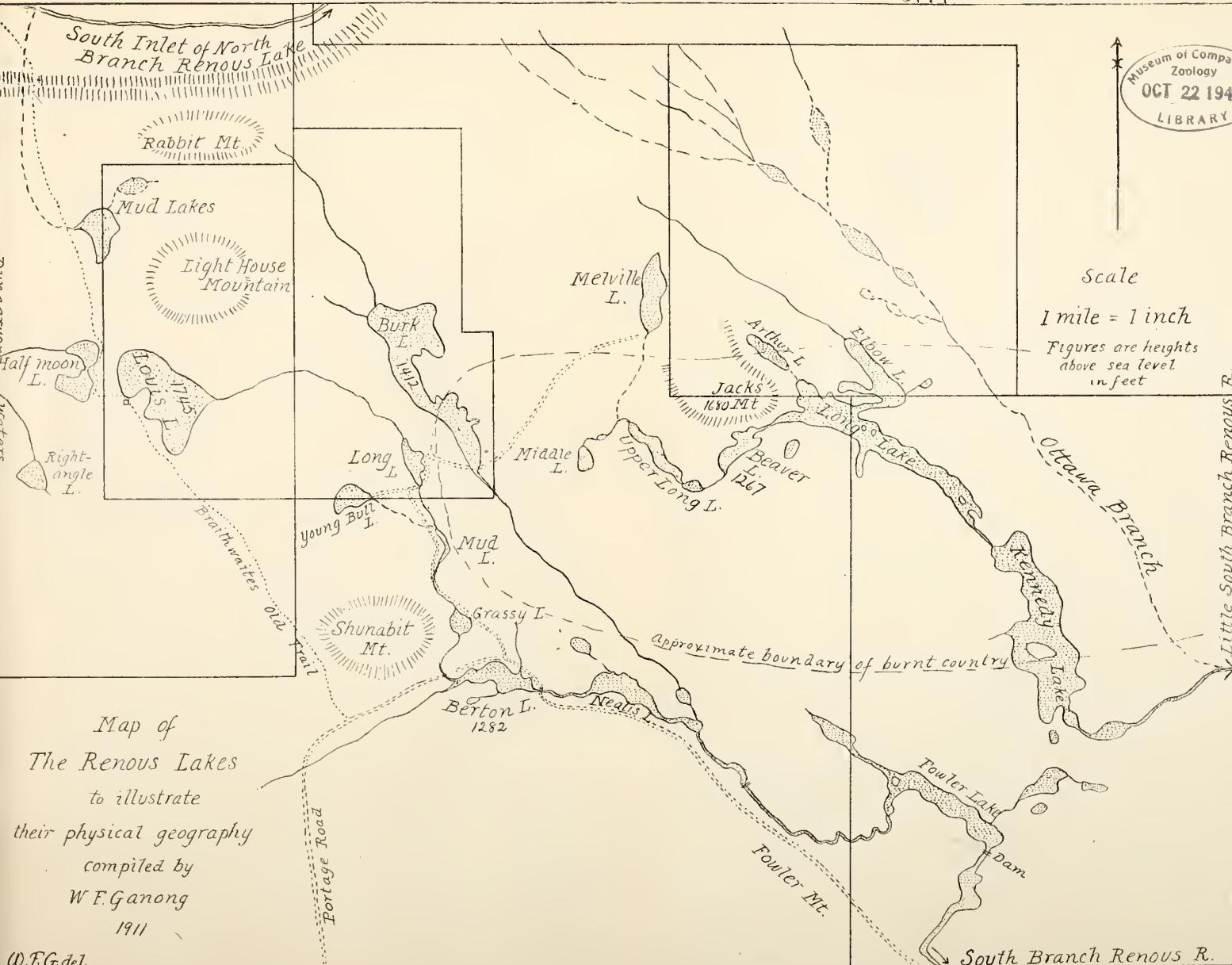
Museum of Comparative  
Zoology  
OCT 22 1940  
LIBRARY

Scale

1 mile = 1 inch

Figures are heights  
above sea level  
in feet

Little South Branch Renous R.



Le uccelli  
e altri animali  
viventi  
sono tutti  
di sangue  
e ossa.

they were by the dams across their outlets; but they lie in a great deep valley separated by a lofty ridge from the Dungarvon on the south.

Burk Lake lies, at a lower level than the stream just west of it, in a broad open and ancient valley, with its upper end nestling into a niche in the great hardwood ridges which rise to the plateau on the north, and its lower end extending out into an open burnt country, through which its outlet runs as shown by the map. Looking up from the shores of Fowler Lake one can follow this great valley, obviously the original morphological source of the South Branch Renous, and can see the great plateau across its head, rising into the more elevated cone-shaped Lighthouse Mountain. This valley extends morphologically right along the margin of Fowler Mountain, the country thence out to Fowler Lake being all flat. Below Fowler Lake the South Branch Renous is said to continue a very rough stream down to the Lower Falls, below which it is smooth and pleasant, and very easy for canoeing, down to the junction with the North Branch, whence to the mouth it has been described fully in these Notes (No. 85).

We consider next the several lakes emptying into the Little South Branch of Renous, all of which lie spread out to view from the great bare granite summit of Jack's Mountain. Northward can be seen the great wooded plateau, in a niche of which lies Melville Lake, and into which are cut the valleys of the streams shown by our map.\*

\* It will be of interest to record here such information as I have been able to glean, chiefly from Mr. Henry Braithwaite, but also from some others, concerning the origin of the nomenclature of this region. Several of the names are, of course simply the obvious descriptive sort. *Louis Lake*, as all agree, was named for Louis Bear, a famous Maliseet Indian hunter, from whom Mr. Braithwaite learned his craft, who used to hunt here, as did the Tobique Indians as far back as 1825 and doubtless earlier, as Mr. Braithwaite tells me. It was for this same Louis Bear, I believe, that Louis Mountain and the Louis (pronounced Lewey) Rapids on the Miramichi above McKeel Brook were named. *Berton* was named for the surveyor who began his survey at its head in 1838, and the name should be thus spelled, and not Burton, as on some plans. *Burk* was named by Edward Jack, (who uses this spelling and not Burke), presumably for some lumberman, while *Melville* was named for Melville Jack, his brother, who did work for the lumbermen in this region. *Fowler Lake* was named for James Fowler, an early lumberman, and *Kennedy Lake* for John Kennedy who made timber there. This name, by the way, appears on Fish's Plan, as *Canada*, doubtless because he misunderstood the name when told him, and it is shown on his plan in a very erroneous position and form. The *Ottawa Branch* was named, reason unknown, by Daniel McLaughlin who lumbered

This plateau slopes downward towards the southeast to a lower open rolling country completely and desolately burnt,\* and paved titanically by granite boulders. In shallow valleys of this desert lie the lakes,— Middle Lake, surrounded by bog, as is the stream to Upper Long Lake, which is narrow and straight; Beaver Lake, irregular and desolate; Long Lake, remarkable for its straightness, and its extensions into others; Kennedy Lake, with its lower part in the unburnt country, and some others of minor prominence only partially shown by our map. The streams between these lakes run deep among huge boulders, which also form the shores, making them forbidding of aspect and difficult of use for camping or any other purposes. While at first sight the lakes appear to bear no definite order, a closer inspection will show that they lie really in valleys having the Northwest Southeast directions characteristic of the ancient valleys of all this region.

The Ottawa Branch I have not seen. It is said to include no real lakes, but a good many deadwaters and ponds, between which the stream is mostly rough. It is reckoned by the guides as the main stream, that from the lakes being considered a branch. The combined streams are said to be rough down to the junction with the North Branch of Renous.

Summarizing now the general physiographic condition of this region, it is evident that we are dealing with a part of the South eastern margin of the great central highlands, just where these highlands are sloping down to the lower country which extends eastward to the sea. This part of the highlands, moreover, is cut off from the rest by a great cross valley,— that

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largely upon it, whence it is also sometimes called the *McLaughlin Branch*. *Lighthouse Mountain* is so named because of a conspicuous bare place on its north side visible from a long distance. The most interesting name in the region is *Shunabit Mountain*, (also pronounced Shunabut and Shunabuck and written *Shanaput* by Mr. Ristein), which I suspect to be Indian, though Mr. Braithwaite suggests a somewhat jocose origin in the opinion of lumbermen that it was a place to shun a bit. *Jack's Mountain*, was named for Edward Jack who conducted a survey of this vicinity. Five of the lakes, previously without recognized names, I have named myself, *Young Bull* for a superb young bull moose we saw there; *Right-Angle Lake* for a prominent characteristic; *Middle Lake*, for its position; *Arthur Lake* for my companion; *Elbow Lake* for its shape.

\*This country has obviously been burnt twice. Mr. Mandeville tells me it was last burnt in August 1905, and before that about thirty-five years ago.

in which runs the South Inlet of North Branch Renous Lake and other waters. It can be traced westward into the upper part of the Tuadook Branch of the Little Southwest Miramichi, as shown in an earlier note (No. 86, *Bulletin* XXIII, 326), and also eastward, though less clearly. From the South Inlet, and also from other places to the northward, one can see clearly the great abrupt lofty slope of the edge of this plateau. This valley, by the way, doubtless owes its existence to the fact that all of this part of this country is built of intrusive rocks which came up in great parallel northeast-southwest ridges, occasionally leaving between them a line of softer rocks which have since eroded away to leave a cross valley, an arrangement which explains other valleys as well,—notably the Tuadook farther north, and the Main Southwest Miramichi above Fall Brook. The original drainage of the country was, however, to the southeast, at right angles to the later-formed cross valleys, which explains the prevailing directions of valleys, lakes, and ridges. Since this part of the highlands is the part where they slope abruptly down to the low country, the ridges left between the valleys project out like fingers, which end more or less abruptly. Jack's Mountain is one of these fingers and others can be seen therefrom, looking like abrupt hills from the eastward. Finally the ice of the Glacial Period swept the granite from the top of the plateau down to the low country, dropping it largely in the angle between highlands and lowlands, thus damming the valleys at that place, and bringing it to pass that many of the lakes lie with their heads in niches of the highlands and their feet in the open country.

## PREHISTORIC CHRONOLOGY FROM THE EGYPTIAN MONUMENTS.

Written history was once the basis from which chronology was drawn, but the decypherment of the inscriptions on the Egyptian monuments has afforded a new basis of computation, carrying the history of mankind far beyond the records of classic antiquity.

These Egyptian tombs and pyramids were erected in a country remarkable for its dry climate, which has preserved these old hieroglyphic inscriptions for thousands of years.

The Greek historian, Herodotus, learned something of Egyptian history from the priests of the temples in his day, and the names of several of the Pharaohs of the monuments have been recognized in his long list of Egyptian kings. The early king of Egypt as depicted on the monument seated on his throne, with consorts beside him, seems very primitive in his simple robes and *bare* feet, yet his subjects lived in civilized communities, carried on trade with the surrounding nations, and worked mines in the neighboring region of Sinai. They, however, had no weapons or implements of metal, but had made considerable advances in the manufacture of pottery and other arts.

The chronology of Egypt, in brief, was as follows:—

	Years.
The Ancient Empire lasted for.....	1600
The Middle Empire.....	500
Domination of the Hyksos or Shepherd Kings.....	500
The New Empire.....	600
This Empire broke up into petty states frequently dominated by foreign nations, Assyrian, Ethiopean, Persian and finally Greek.....	800

The Greek invasion occurred 330 B. C., so that the earliest Egyptian records go back to more than 4,000 B. C., and yet they belong, judging from the arts and culture of the people, only to the close, or latest stage of the Neolithic Age.

The Egyptian culture is also useful as giving us a connecting link with that of Europe, for the Bronze age began in Egypt about 2600 B. C. or before the time of the Hyksos domination.

\*Brugsch's Egypt under the Pharaohs, London, 1879. Vol. II., p. 311.

## ARTICLE III.

### NATURAL HISTORY OF ROCKWOOD PARK.

#### ROCKS AND MINERALS OF ROCKWOOD PARK.

BY G. F. MATTHEW.

Abstract of Address given December 6, 1910.

**MINERALS.**—Owing to the frequent exposure of rocky ledges in various parts of the Park, several kinds of minerals and rocks have been noticed, and some have been mined and others quarried.

*Black Lead or Graphite.*—Many years ago a mine of black lead was worked by the Gilberts at Lead Mine Point—a low point of land on the eastern side of Lily lake near its outlet. The mineral mined here was of a kind suitable for stove polish and for foundry facings, but not for purposes to which the finer grades of graphite are applied.

*Ophicalcite or Verd Antique.*—The translucent green variety of serpentine occurring in magnesian crystalline limestone, is found in the limestones at the west end and the north side of Lily lake. The best examples observed were from limestone a little west of the western boundary of the park.

*Common Serpentine.*—This kind of serpentine which is the result of metamorphism in igneous rocks, is present in a vein or dyke of such rock that cuts the quartzite at the southwest side of Look-out hill, just back of the northern cove of Lily lake. It is a dark, gray rock mottled with spots of lighter gray, giving the appearance of a snake's skin, hence the names "Ophite," or "Serpentine," by which it is known.

*Tremolite.*—This is a light gray, fibrous, or bladed mineral, found in the magnesian limestones on the Adelaide road, that would extend across the northern end of the park by Dark lake. It may occur in any of the magnesian limestones, found in the area of the park.

*Stalactite and Stalagmite.*—These are varieties of lime or calcite found in caverns in limestone rock; examples have been found

in Dark lake cave and elsewhere. Crystalline calcite or carbonate of lime has been found in seams of the limestone rocks in several forms of crystals.

*Asbestus* has been found in the magnesian rocks that accompany the upper limestones of Lily lake.

Other minerals that occur in the park are *Epidote*, a grass-green mineral, found on jointed surfaces and in veins of the granitic rocks; *Tourmaline*, which occurs in quartz veins of the schists further eastward, may be looked for in the schistose rocks of the park; *Zircon* has been found in microscopic crystals in the granitic rocks of the park; *Hyacinth*, is a translucent variety of the same mineral. *Quartz*, occurs in prismatic crystals in the quartz veins, etc.; *Feldspar*, in tabular crystals, as a constituent of the granitic rocks; *Hornblende*, as a common mineral of the syenitic rocks.

**Rocks.**—Besides the limestones which are noticeable at many points in the park, there are hills and ridges of *Syenite*, or quartz-diorite, that are prominent in the northern half of the park; the highest hill in the park, on its western margin, is of rock of this kind. Another hard rock which forms the ridge on the northwest side of Lily lake, and becomes more prominent at the Look-out hill is *Quartzite*, or metamorphic sandstone. The southern ridge in the park overlooking the "Valley" and the "Marsh" is composed of ancient volcanic rocks, with scoriaceous (amygdaloidal) and fragmentary beds (braccias) at the base, and finer (volcanic ash) beds higher up; the whole mass is now so thoroughly compacted and hardened as to form a prominent ridge rising higher than the limestones of Lily lake, etc., to the north of the Valley deposits on the southern margin of the park.

The *limestone* beds are numerous and show much variety of composition, some purely calcareous, others highly magnesian, others with so much disseminated carbonaceous or graphitic matter as to have a dark "blue" or gray color.

A study of the topography of the park will show how intimately its physical features are connected with the nature of the rocks which underlie its hills and valleys, and rise in many places to the surface.

PHYSICAL GEOGRAPHY (Introduction)—Some of the rock masses in Rockwood Park go back to the dawn of Geologic Time, and it is these that have played the most important part in moulding the more striking features of its physical geography; fully three-quarters of its surface are underlain by these ancient rocks. They are of "Laurentian Age" and form what geologists call a "Complex" or "Massif," against which later accumulations of sand and clay were ridged up, or with which from time to time the "Massif" was covered,

It would take more time and space then we can here spare to go into the particulars of the geological changes that produced the "Massif" but we are to understand that the greater part of its mass consisted of deposits of mud and sand, laid down on the bottom of a primeval sea and subsequently hardened into solid rock and now further consolidated into limestones, schists and quartzites.

Thus we find in the old Laurentian Complex three principal varieties of stratified rocks. Into these rocks intruded molten matter from the interior of the earth which partly fused and broke them up, and which when they reached the surface showed themselves as granitic bosses or prominences in various parts of the park.

Many of the beds in these deposits abounded in lime and were probably the first to harden, these produced limestones. Others were of nearly pure sand, which first hardened into sandstones, and later by a cementing together of the individual grains, into quartzites. Other beds, in which clay or mud was a principal ingredient, were more liable to chemical change, and were converted into the schists and gneisses, which form a considerable part of the rock masses in the Park.

## FLOWERING PLANTS AND TREES OF ROCKWOOD PARK.

By G. U. HAY,

Abstract of Article read January 3, 1911.

The numerous well beaten paths, the trails of seekers after adventure and wild flowers for generations past, easily guide through Rockwood Park those in quest of the fresh floral treasures of spring and summer. But these byways tell another tale. Some of the rarest of the wild flowers are no longer to be found, and the mayflower, once so abundant, is in danger of becoming exterminated by careless pickers who tear away the creeping stems. The bump of acquisitiveness is so strongly developed in children and in some of larger growth, that the temptation to gather everything in sight is strong, especially of our choicest flowers. Happily there is a growing disposition, and that disposition is being fostered by the more thoughtful teachers of our public schools, that there is more delight in seeing a flower grow and in leaving its beauty and fragrance for others to enjoy, than to scatter its withered petals along the pathway or the street.

Rockwood is one of the most natural parks in America and it should be most diligently impressed on all to preserve as completely as possible for future generations its wild flowers, birds and other natural features. The unwritten law of the Horticultural Garden, not to pick flowers, might well be applied to the whole Park.

A walk through the Garden in late April or early May does not reveal many flowers in bloom other than the rock cress or the deep blue scillas; but a little later there are daffodils, hyacinths, saxifrages, pansies, tulips, primulas, hawthorn, Siberian pea, followed by columbines of many colors, lupins, larkspurs and others, many of which remind one of the hillsides and hedge-rows of England. There they grow wild, and much earlier than with us, a tribute to fewer frosts, a more pervading moisture and the richer soil of Britain.

The wind-swept hills of Rockwood Park are not places on which to find the plants that grow in profusion on the meadows and hills farther inland, but there are potholes, basins at the foot of cliffs, secluded little valleys that contain violets, trilliums, adder's tongue (fawn lily), spring beauties, clintonias, bellworts, lady's slippers and other orchids such as arethusa, calopogon, calypso and habenarias. There are lakes which contain the nymphaea or white water-lily and the nuphar or yellow pond-lily; bogs and stretches of heath covered with the leather leaf (*Chamaedaphne calyculata*) and the bog rosemary (*andromeda glaucophylla*) the rhodora and the two kalmias (*Kalmia angustifolia* and *K. polifolia*) the early blooming mountain-fly honeysuckle, the Labrador tea, the creeping snowberry, the pyrolas, vacciniums (including the blueberries and cranberries) viburnums or withe-rods, taking in one of the most abundant shrubs in the park, the *Viburnum cassinoides*, or wild raisin, found everywhere in swamps and open places. Clothing the rocks in many places are mats of the rock or mountain cranberry, its thick shining leaves, rose-pink flowers, dark red berries forming a perennially beautiful ornament of the park.

The most conspicuous and abundant trees in the park are the white cedar or arbor vitae and the white birch, the milk-white scattered stems of the one forming, especially in winter, a striking contrast to the dense, coneshaped clusters of the other. In late May or during the early days of June the amelanchier or June-berry is in bloom and a week later the wild red cherry. The amelanchier (*amelanchier canadensis*) is especially beautiful, the snowy white of its large blossoms and the brownish-purple of its opening leaves forming a marked contrast to the gray rocks of the hillsides. There are two other species of amelanchier which scarcely rise to the dignity of trees (*A. oblongifolia* and *A. oligocarpa*) the blossoms of which are smaller and the leaves not so large or so well marked. There is no more beautiful display in the park than that of the amelanchier trees of early June, and this beauty may be preserved and increased from year to year if visitors will refrain from breaking off branches while the trees are in blossom.

In the late summer the asters and golden-rods, the daisies and hawkweeds, the trumpet flower and other members of the Composite family are especially evident, although they are in abundance at all seasons. Two at least of this numerous family may be found among the earliest spring flowers in the park, the coltsfoot (*Tussilago farfara*) and the sweet coltsfoot (*Petasites palmata*).

It is in the days of September and October when the trees put on their autumn garb that the park looks its best. The maples, oaks, sumachs are scarlet and red, the larches, poplars and birches yellow; the leaves of the vacciniums are purple and red. Everywhere the deciduous trees are changing; only the evergreens stand to their colors.

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#### FERNS FOUND NEAR ST. JOHN.

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BY W. J. S. MYLES.

(Synopsis of Paper Read Feb. 7, 1911.)

In his address Mr. Myles referred to the pleasures connected with the study of ferns, described in detail the characteristics of the several species here enumerated and discussed the folklore associated with various ferns.

The following list of ferns, with the exception of *Botrychium Lunaria*, represents the results of several seasons, close observation of a small section of territory included within the limits of the City of St. John. This district about one and a half miles long by half a mile wide, lies between the Millidgeville Road and the St. John River. It embraces a small shallow lake, a short strip of alluvial shore and a high limestone ridge well wooded in sections and skirted by pasture land. The list includes every fern reported from St. John County, and shows what excellent opportunities for fern study are afforded the members of the Natural History Society. In his catalogue of Canadian Plants,

Macoun enumerates thirty-one species of ferns as occurring in New Brunswick and of these twenty-two are to be found in this section of St. John.

In this list of the species found near St. John, the nomenclature is that used in the sixth edition of Gray's Manual.

Botanical Name.	Popular Name.	Occurrence.
<i>Polypodium vulgare</i> . . . . .	Rock fern . . . . .	common
<i>Pteris aquilina</i> . . . . .	Common Brake . . . . .	very common
<i>Asplenium viride</i> . . . . .	Green Spleenwort . . . . .	continuous along limestone ridge, but rare
<i>Asplenium thelypteroides</i> . . . . .	Silver Spleenwort . . . . .	rare
<i>Asplenium filix-foemina</i> . . . . .	Lady fern . . . . .	very common
<i>Phegopteris polypodioides</i> . . . . .	Long Beech fern . . . . .	very common
<i>Phegopteris Dryopteris</i> . . . . .	Oak fern . . . . .	very common
<i>Aspidium thelypteris</i> . . . . .	Marsh fern . . . . .	common
<i>Aspidium novaboracense</i> . . . . .	New York fern . . . . .	scarce
<i>Aspidium spinulosum</i> . . . . .	Spinulose Wood . . . . .	very common
(both varieties <i>intermedium</i> and <i>dilatatum</i> occur.)		
<i>Aspidium cristatum</i> . . . . .	Crested Shield . . . . .	common
<i>Aspidium marginale</i> . . . . .	Marginal Shield . . . . .	common
<i>Aspidium acrostichoides</i> . . . . .	Christmas fern . . . . .	common
<i>Cystopteris fragilis</i> . . . . .	Fragile Bladder . . . . .	scarce
<i>Cystopteris bulbifera</i> . . . . .	Bulblet Bladder . . . . .	common
<i>Onoclea sensibilis</i> . . . . .	Sensitive fern . . . . .	common
<i>Onoclea struthiopteris</i> . . . . .	Ostrich fern . . . . .	scarce
<i>Woodsia Ilvensis</i> . . . . .	Rusty Woodsia . . . . .	one station
<i>Dicksonia pilosiuscula</i> . . . . .	Hay-scented fern . . . . .	very common
<i>Osmunda regalis</i> . . . . .	Royal fern . . . . .	a few stations
<i>Osmunda Claytoniana</i> . . . . .	Interrupted fern . . . . .	very common
<i>Osmunda cinnamomea</i> . . . . .	Cinnamon fern . . . . .	very common

#### OPHIOGLOSSACEAE

<i>Botrychium virginianum</i> . . . . .	Rattlesnake fern . . . . .	common
<i>Botrychium Lunaria</i> . . . . .	Moonwort . . . . .	one station in Rockwood Park.
<i>Botrychium obliquum</i> . . . . .	Common Grape fern . . . . .	one specimen found

The form *Botrychium dissectum* in Macoun's catalogue not reported from New Brunswick is abundant at a station near Hampton but I have not found it in St. John.

## MAMMALS OF ROCKWOOD PARK.

BY J. W. BANKS.

Abstract of Paper Read April 4th, 1911.

Night wandering bat (*Lasionycteris noctivagans*).

Brown bat (*vespertilio subulatus*). Their food consists of small flying insects, active at night, sleeping through the day in a sheltered situation; dormant in winter.

Smoky shrew (*Sorex fumeus*). The shrews are the smallest of the Mammals, resembling small mice. They are active in the daytime as well as at night.

Northern white-footed deer mouse (*Peromys leucopus-novæborcensis*). They nest in old stumps, and hollow trees. Sometimes an old nuthatch's nest is used. They are active at night, winter and summer.

Canadian field mouse (*Peromys canadensis*) is distinguished from the deer mouse, by its blunt nose and short tail. This mouse is destructive to young fruit trees. They are active at night, summer and winter.

Star-nosed mole (*Condylura cristata*) inhabits dry situations. Its sleeping room, entered by several passages, is situated under a hillock.

Common mole (*Scalops aquaticus*) is found in marshy situations, or near water. The food of both the star-nosed and common mole consists largely of earthworms and grubs.

Red squirrel. Eastern chickaree (*Sciurus hudsonicus gymnicus*) is active winter and summer.

Lyster's striped chipmunk (*Tamias striatus lysteri*) or ground squirrel; is distinguished from the preceding by its smaller size and striped coat. Their burrows are deep under ground, where they spend the winter.

Boreal flying squirrel (*Sciuropterus sabrinus*) seemingly divides the day and the night; as I have frequently seen them up till mid-day, but never in the afternoon, and it is known to be nocturnal in its habits.

Canadian woodchuck (*Marmota monax canadensis*) brownish grey in color, in size about that of a house-cat, feeds on different forms of vegetable substances. Becomes excessively fat late in the autumn, and dens deep in the ground in winter.

Canadian tree porcupine (*Erethizon dorsatum*) feeds on the bark of different trees; dens in caves beyond the reach of frost, where it lies dormant the greater part of the winter.

Muskrat (*Fiber zibethicus*). The food of the muskrat consists for the most part of the roots and stems of waterplants, and although not fish eaters, they are very fond of fresh water mussels. Their dens are usually some distance from the edge of the lake in which they live, and are reached by runways below the surface of the water. They are active winter and summer.

American hare (*Lepus americanus*) also called the varying hare, from its habit of changing its color from brownish grey in summer to white, when the snow covers the ground.

Canada skunk (*Mephitis mephitica*) make their dens in holes and crevices, in rocky situations beyond the reach of frost, where they remain during the winter. Their food is both animal and vegetable.

Weasel (*Putorius novæboracensis occisor*). The color of the weasel is yellowish white in winter, in summer it is a beautiful nut brown; the tip of the tail is always black. They are active summer and winter.

Mink (*Putorius vison*) rare at the present time. Trout is his favorite food. The brookside is a common lurking place, where his dark brown coat is well nigh invisible.

Common raccoon (*Procyon lotor*) is a tree climber and spends the greater part of the day asleep in the fork of a large tree. Fish or flesh is his usual diet, providing it is clean and fresh.

Red fox (*Vulpes fulva*). The patch fox, silver grey, and black fox are color varieties of this species. One and sometimes two black pups have been seen in a litter of five. The fox is a noted scavenger.

Red lynx, wild-cat (*Felis rubra*) inhabits thickly wooded ravines. Formidable and fierce in appearance, yet has never been known to attack man. They are active summer and winter.

American black bear (*Ursus americanus*). The bears in confinement at the park are of this species. Bears have not been seen wild in Rockwood Park for a number of years.

Northern white-tailed deer (*Odontocoelus americanus borealis*) may be commonly seen at the present time in their wild state in the park.

Moose (*Alce alces*) have been seen on several occasions within the limits of the park.

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#### INSECTS OF ROCKWOOD PARK AND VICINITY.

By WM. McINTOSH.

(Abstract of Address given March 7, 1911.)

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The lecturer threw on the screen many beautiful pictures of the scenery in the park, and a map showing the various lakes and ponds by which its scenery is diversified; he also had pictures of common and the rarer insect life met with in the park. He showed how large the subject was when he stated that he himself had taken hundreds of different species of butterflies and moths and five hundred species of beetles in the district. Mr. McIntosh dealt chiefly with the insects that were important as food for fishes.

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#### BIRDS OF ROCKWOOD PARK.

By A. GORDON LEAVITT.

(Abstract of Address given May 2, 1911.)

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Mr. Leavitt handled his subject well and gave a great deal of information about the birds of the park that was useful and interesting; he also made a strong plea for adequate protection to our feathered friends, whose usefulness to the farmer and the gardener were not fully appreciated.

The lecturer then turned himself to an exhibition with the Reflectoscope of the most striking and best known of our native birds, showing pictures of the Blue Bird, American Robin, various thrushes and Kinglets, Chickadees, Wrens, Swallows, Butcher Bird, and many other kinds that make the Park melodious in their season.

## ARTICLE IV.

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### NOTES ON NEW BRUNSWICK WEATHER FOR 1910.

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By D. LEAVITT HUTCHINSON.

*January*.—The weather was seasonable until the 19th, and although the snow-covering was extremely light, sleighing was fairly good during the first half of the month. From the 19th to the last day of the month, when somewhat colder conditions again set in, mild spring-like weather was general, river ice running and the buds on trees swelling. The ground was completely bare of snow in nearly all the southern parts of the Province at the close of the month. Moderate southwest gales on the 2nd and 6th, northwest on the 4th, south on the 19th, southeast on the 22nd, south to west on the 29th and 30th, the latter being accompanied by heavy rain, over two inches being recorded at St. John on the 29th. The highest temperature 55 was recorded at Fredericton on the 22nd and the lowest 20 below zero at Fredericton on the 15th.

*February*.—The remarkable mildness of the two preceding months continued throughout February. The only marked cold period being between the 24th and 26th when temperatures well below zero were fairly general. The snowfall, though not heavy, was in excess of December and January combined. A southeast to south gale with velocity of seventy-two miles an hour in the Bay of Fundy, and a moderate south to southwest gale on the 27th were the only important storms of the month. Owing to rainfall at the close of the month, the snow covering near the coast line was nearly gone, but in the interior and northern districts from 12 to 20 inches were reported. The sleighing was good throughout the month. Highest temperature 46 at Grand Manan on the 21st. Lowest 26 below zero at St. Stephen on the 25th.

*March*.—March was abnormally mild and dry with an unusual amount of sunshine. Wind mileage was below the average and no gales of importance occurred. In most parts of southern New Brunswick the ground was practically bare of snow throughout the month, while on the north shore and in the woods of the interior from six inches to two feet was reported. An aurora of great brilliancy was observed on night of the 28th. Highest temperature 72 at St. Stephen on the 25th. Lowest zero at Dalhousie on the 6th and Fredericton on the 11th.

*April*.—April weather was about equally divided between dull and wet and fine days. Up to the 19th it was comparatively dry except on the 7th, when heavy showers accompanied a thunderstorm. Between the 19th and 23rd the rainfall was exceptionally heavy in most places causing freshets much to the advantage of the lumbermen. Temperatures were unseasonable, high on the 6th, over 70 in the shade being locally recorded, also on the 25th and 26th, followed on the 28th and 29th by a change to freezing weather, and on the 30th by a heavy snowfall attended by thunder and lightning. No gales occurred during the month. Highest temperature 73 at Moncton on the 25th. Lowest 15 at Dalhousie on the 13th.

*May*.—The general features for May were unsettled, dull and wet until the 11th, then an almost unbroken spell of fine pleasant conditions prevailed until the 24th, when it was wet and dull again until the 27th, then fair and rain again on the last day of the month. Snow fell on the 5th, and a few frosts were reported from some localities during the first half of the month. Vegetation everywhere remarkably advanced. Highest temperature 79 at Chatham. Lowest 28 at St. Stephen.

*June*.—Though an unusually wet month there was a fair amount of sunshine, but showers were most persistent. The temperature was up to the seasonal average, without any days of excessive heat. A heavy local frost on the 5th did little damage. Fogs were infrequent, and the wind movement below the average. Highest temperature 84 at Fredericton on the 22nd. Lowest 29 at Sussex on the 5th.

*July*.—The month, as a whole, was mostly fine and seasonably warm, with from ten to twelve days of wet and showery weather, resulting in remarkably abundant crops. Thunderstorms were rather severe and frequent and there was some local damage incident to the lightning and hailstorms. Highest temperature 92 at Chatham on the 10th. Lowest 46 at Chatham on the 5th.

*August*.—Warm and dry, with more fine days than in either of the two preceding months; the greater portion of the total rain fell on the 4th, the 11th and the 19th; no excessively high temperatures were registered, and the only foggy spell of consequence occurred from the 24th to the 26th. Highest temperature 85 at Dalhousie on the 25th. Lowest 33 at Sussex on the 31st.

*September*.—The greater portion of the month was fine; rainfall exceptionally light and temperature slightly cooler than the average. No wind storms occurred in southern New Brunswick and the few local frosts reported were mostly light. Highest temperature 77 at Chatham on the 12th. Lowest 30 at Moncton on the 29th.

*October*.—The weather of October was about equally divided between dull, stormy and wet, and fine days, with rainfall not up to the seasonal average. Thunderstorms occurred on the 1st and 20th, and gales on the 2nd, 4th, 10th, 24th and 27th. The first freezing temperature was recorded on the 21st, and local snow flurries occurred about the middle and end of the month. Highest temperature 78 at Fredericton on the 6th. Lowest 20 at St. Stephen on the 31st.

*November*.—An exceptionally dull, mild, and unsettled month. Clear nights and bright sunshine were remarkably deficient. Generally precipitation was below the average. In northern New Brunswick and in parts of the interior, a moderate snow covering was reported, while elsewhere the ground was bare and free from frost. The St. John River, and all lakes and streams were open. A northeast storm on the 27th, accompanied by snow, sleet, and rain caused some damage. Highest temperature 65 at Dalhousie on the 20th. Lowest 15 at St. Stephen on the 21st.

*December.*—In southern New Brunswick moderate temperature conditions prevailed through the first half of the month when nearly the total snowfall was recorded. Weather changes then occurred with marked rapidity, zero temperatures from the 16th to 18th; heavy rainfall and mild thawing conditions on the 19th quickly turning colder again followed by another very heavy rainfall on the 25th; the month closed with minimum below zero and a temperature range of 50 degrees on the last two days. Heaviest gales of the month occurred on the 16th and 31st, both from northwest. At the close of the month the ground was bare of snow in nearly all localities. Highest temperature 55 at Grand Manan on the 24th. Lowest 20 below zero at St. Stephen on the 18th.

## ST. JOHN OBSERVATORY.

## WIND DIRECTION AND VELOCITY FOR 1910.

MONTHS.	1910		N.		N. E.		E.		S. E.		S.		S. W.		W.		N. W.	
	Hours	Miles	Hours	Miles	Hours	Miles	Hours	Miles	Hours	Miles	Hours	Miles	Hours	Miles	Hours	Miles	Hours	Miles
January.....	122	1,362	92	845	5	24	70	1,459	39	616	120	2,158	74	864	199	3,035	23	10,363
February.....	133	1,512	82	972	21	240	20	286	60	901	95	1,647	95	1,118	162	2,271	4	8,947
March.....	96	823	90	829	29	399	36	449	134	2,241	126	2,151	37	326	169	2,361	27	9,579
April.....	37	439	17	162	125	1,514	122	1,365	158	1,679	31	249	32	234	143	2,183	55	7,825
May.....	86	1,161	93	1,150	88	943	72	554	279	2,749	27	311	17	150	70	966	12	7,984
June.....	76	739	51	405	73	798	90	829	203	2,051	88	912	32	365	93	1,180	14	7,279
July.....	45	425	62	523	16	94	85	633	348	2,650	105	1,508	26	219	28	192	29	6,244
August.....	43	236	45	346	32	231	81	564	243	1,380	147	1,492	11	46	63	398	79	5,093
September.....	118	1,040	114	998	51	429	21	157	109	874	97	1,124	38	379	63	786	109	5,787
October.....	98	1,190	85	941	30	281	26	258	116	1,295	123	1,805	35	331	212	4,442	19	10,543
November.....	81	751	218	2,775	34	242	31	367	35	405	65	876	45	433	184	2,608	27	8,457
December.....	135	1,413	74	871	10	104	53	1101	23	460	65	932	51	450	326	5,356	7	10,687
TOTALS.....	1,070	11,091	1,033	10,817	514	5,299	707	8,022	1,747	17,501	1,089	15,165	493	4,915	1,712	25,978	405	98,788

## METEOROLOGICAL ABSTRACT FOR 1910.

## ST. JOHN OBSERVATORY.

METEOROLOGICAL SERVICE OF CANADA.

Latitude, 45° 16' 4".50 N.

Longitude, 66° 3' 48" W.

MONTHS 1910.	BAROMETER.			THERMOMETER.			Cloudiness 0 = Clear. 10 = Wholly Clouded	Precipitation. Rain and Melted Snow.	Thunder Storms.	Fogs.
	Mean	Highest	Lowest	Mean	Highest	Lowest				
January.....	30.070	30.710	29.228	27.0	52.5	- 7.7	6.3	5.68	0	2
February.....	30.011	30.805	29.256	24.3	44.0	- 2.0	6.0	4.12	0	2
March.....	30.035	30.556	29.418	33.6	52.7	9.9	5.9	1.80	0	0
April.....	29.986	30.449	29.600	43.7	66.5	25.7	6.5	7.72	3	5
May.....	29.805	30.368	29.400	49.0	69.9	29.5	6.4	3.49	1	5
June.....	29.883	30.270	29.501	57.0	75.8	39.3	6.0	4.01	2	1
July.....	29.858	30.200	29.482	61.2	76.5	49.7	5.5	3.88	5	2
August.....	30.058	30.390	29.552	61.3	78.0	47.7	4.4	2.58	2	7
September....	30.087	30.377	29.724	56.6	73.0	44.5	5.1	2.02	0	7
October.....	29.575	30.493	29.209	46.9	61.3	30.7	5.8	3.82	2	4
November....	29.700	30.379	29.213	37.7	54.3	25.5	7.3	2.52	0	9
December....	29.910	30.691	29.237	23.3	47.7	- 2.7	6.2	4.60	0	2

Mean height of barometer for year was 29.915, the highest reading 30.805 on 26th February, and the lowest 29.209 on the 26th October. The average temperature for the year was 43.5, which was 2.4 above the average of the past thirty-eight years. Maximum temperature 78 occurred on the 15th of August and the minimum 7.7 below zero on the 5th of January. Total precipitation 46.24 was 0.19 below average.

D. L. HUTCHINSON,  
Director St. John Observatory.

FORTY-NINTH ANNUAL REPORT  
OF THE  
COUNCIL OF THE NATURAL HISTORY SOCIETY  
OF  
NEW BRUNSWICK.

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Your Council begs leave to submit the following report of the year ending September 30th, 1911.

MEMBERSHIP.

During the year we regret there has been a slight decrease in the regular members, but the Associate, Junior and Junior Associate membership show substantial increase.

The enrolled membership of all classes is as follows:

Honorary.....	3
Life.....	20
Corresponding.....	15
Regular.....	155
Associate.....	346
Junior Associate.....	20
Junior.....	36
<hr/> Total.....	595

LIBRARY.

Owing to extensive repairs to the building, nothing could be done to catalogue, or make any attempt at anything like an orderly arrangement of the books in the library.

A room has been set apart on the upper floor to be known as the Study Library, where students will have an opportunity to pursue their researches. This room has been shelved and well filled with books dealing with the Natural History subjects and all arranged alphabetically.

## TREASURER'S REPORT.

The statement submitted herewith, shows the financial transactions of the Society for the year 1910-11 to have been the heaviest in the Society's history, and one of the items of "Expenditure," namely, "retired mortgages" should certainly be underlined in order that it may not escape the notice of any of the members.

When the Society, on the 5th day of May, 1906, paid Mrs. Finn the sum of twenty-five dollars to bind the bargain for the purchase of the beautiful and valuable building we now occupy, it surely acted wisely, and it was fortunate in being in a position, on the 12th day of June of that same year, to pay the balance of the purchase price and receive a deed of the property, although it had to raise \$3,500 on mortgage. Another step in the right direction and one indication of the Society's progress was taken on January 14th, 1908, when \$500.00 was paid on account of one of the mortgages, but December 12th, 1910, the day on which the mortgages were discharged, and on which the Society found itself the owner of a valuable property devoid of any mortgage or other claim, must always appear as *the "red letter day."* Thanks to the generosity of the Provincial Government and the City of St. John, we have been about able to pay the running expenses but it must be acknowledged that, for the valuable work we are doing, our grants are not as large as they should be, and that they will not stand comparison with those to similar institutions in other cities. We are thankful for what we receive, but do feel that we should receive something more.

There is probably no similar society which does so much on so small an income, and the explanation is that we are fortunate in having so many free workers, and a Curator who does many times the work for which he receives remuneration.

Besides the balance at the Society's credit in the Bank of New Brunswick, \$231.54, as shown in the statement, the balance at credit of "special account" in the same bank is \$3,876.55, and we estimate the outstanding bills in connection with the improvements to the building at \$1,200.00.

Many will no doubt marvel at the small cost of changing the building from what it was, to what it now is, but it is only necessary to say that the strictest economy has been observed, and that no architects fees were paid, the Curator, Mr. McIntosh, having made all the plans and superintended all the work of change and improvement.

Our thanks are due the Ladies' Association for their generous donation.

Although the Society is in such an enviable position their remains need of strong efforts, with a view to increasing its income, as there is still much that should be done to increase our usefulness as an educative institution.

A. GORDON LEAVITT.

FOR THE YEAR ENDING OCTOBER 1ST, 1911.

*Income—*

Balance from 1909-10.....	\$378 12
Regular Fees.....	\$291 00
Associate Fees.....	299 00
Junior Fees.....	12 00
Junior Associate Fees.....	8 00
	610 00
From Ladies' Association.....	150 00
N. B. Government Grant.....	400 00
City of St. John Grant.....	250 00
From Estate Catherine Murdoch.....	\$3,992 63
"    "    "    ".....	33 25
	4,025 88
Use of Reflectoscope.....	3 00
From Special Account.....	3,985 32
	\$9,802 32

*Expenditure—*

Maintenance of Museum.....	\$ 34 61
Material for Museum Purchased.....	17 00
Fuel \$163.57, Lighting \$58.13.....	221 70
Stationery, Printing \$31.25, Postage \$38.20.....	69 45
Cleaning \$38.50, Sundries \$21.19.....	59 69
Insurance \$82.10, Water Rates (2 years) \$56.00.....	138 10

*Carried forward,.....* \$ \$9,802 32

<i>Brought forward</i> .....	\$	9,802	32
Salaries \$799.90, Commissions on Collections \$56.60...	856	50	
Cost of Bulletin XXVIII.....	207	05	
Interest on Mortgages \$85.00, Expenses of Lectures \$6.75	91	75	
Rent of Telephone, Tolls \$41.00, Cartage and Express- age \$8.10.....	49	10	
Deposited in "Special Account".....	3,992	63	
Retired Mortgages, Roach \$2,000.00, Hay \$1,500.00....	3,500	00	
Costs in Registration of Releases, etc.....	3	20	
Returned to "Special Account".....	200	00	
Improvements to Building (on account).....	130	00	
Balance in Bank of New Brunswick.....	231	54	
			————— \$9,802 32

A. GORDON LEAVITT, *Treasurer.*

Examined and found correct.

October 1st, 1911.

TIMOTHY O'BRIEN,  
B. H. BELYEAE, } *Auditors.*

SPECIAL ACCOUNT FOR THE YEAR ENDING OCTOBER 1ST, 1911.

1910	DR.	
Oct. 1	Balance in Bank of N. B.....	\$3,561 01
Dec. 20	From Executor of Estate of C. Murdoch.....	3,992 63
	20 Interest on Deposit, Bank of N. B.....	47 23
1911		
June 30	Interest on Deposit, Bank of N. B.....	61 00
		—————
		\$7,661 87

1910	CR.	
Dec. 10	Retired Mortgages.....	\$3,500 00
1911		
July 22	Transferred to Regular Account.....	255 32
Sept. 16	Transferred to Regular Account.....	30 00
	Balance in Bank of N. B.....	3,876 55
		—————
		\$7,661 87

A. GORDON LEAVITT, *Treasurer*

October 1, 1911.

Examined and found correct.

TIMOTHY O'BRIEN,  
B. H. BELYEAE, } *Auditors.*

St. John, N. B., October 16th, 1911.

## CURATOR'S REPORT.

GENTLEMEN:

I herewith submit a report of the operations of the museum for the year ending September 30th, 1911.

Having in view the important changes which were to be made in the museum building later in the year, we suspended all work on the exhibition collections, and in April the museum was closed to the public and the collections were packed away. This was a work of some magnitude occupying almost our entire time until the workmen came into the building in June. The end of our year sees the work in the building almost completed, and we hope to begin the rearrangement of our collections almost immediately.

*Visitors.*—The number of people visiting a museum in some degree indicates its value to the community which it serves. The great increase in our visitors yearly is very gratifying, during the six months in the past year in which the museum was open 7,059 persons visited the building, or 1,561 more than during the previous year.

The donations have as usual been a source of pleasure, not alone because of their scientific or intrinsic value, but because they indicate an interest taken in the museum by the public.

Some very valuable specimens are promised when we can provide dust proof cases for their reception.

*Educational.*—During the year a course of children's lectures were given and in addition to these fourteen teachers brought classes to the museum for talks on various subjects. At the request of the Agricultural Department of the Provincial Government, the curator visited all the schools in central and western Charlotte County and the larger schools between McAdam Junction and St. John, giving half hour talks on insect pests and more particularly the Brown-tail Moth. As a result of this work the Brown-tail Moth was found to have become established in the Province.

At the request of teachers, short talks were given in a number of schools on insect life, the stone age in New Brunswick and Indian legends.

In addition to these lectures to school children, the curator addressed a number of clubs and associations, which may properly be considered as part of our scheme of public education.

Forty-one loans or gifts were made to public schools during the year. We regret with our limited means we are not able to properly carry on this valuable part of our work. So many teachers asked for these loan collections that some who gave their names in March, did not get the collection they asked for before the schools closed in June.

Three hundred and fifty-three enquiries were answered.

*Collecting.*—The most important collections made were archaeological. Some material in nearly all branches of natural history were gathered.

#### REPORTS OF COMMITTEES.

##### GEOLOGY (G. F. Matthew, *Chairman.*)

Dr. L. W. Bailey has been studying the Diatomaceæ of New Brunswick. These are microscopic, marine, brackish and fresh-water weeds that are universally distributed. In connection with the living forms he has studied, the skeletons of these organisms found in the mud at the bottom of ponds and estuaries of rivers. An article from Dr. Bailey's pen with an explanatory plate appeared in last year's bulletin and another is published in this one.

Dr. Stopes-Gates, an authoress of note as a geologist, now engaged in work for the British Museum, has been studying the Palæozoic floras of this region, and especially those of the Little River group of which the first type series is in the museum of this Society. She has also carefully examined the set of these plants in the Museum of McGill University and the Devonian plants there, described by Sir Wm. Dawson. These plants are of especial value to science on account of their rarity, their great age and the important light they shed on the Palæozoic floras.

The sudden death of Dr. R. W. Ells of the Canadian Geological Survey is a great loss to the Maritime Provinces, where most of his geological work was performed. For some years

he has been occupied in company with other members of the Survey staff, in a re-study of the geology of northern Nova Scotia and of the southern part of New Brunswick, for the purpose of issuing a new geological map of this district. This map when published will give the latest information obtained by the Survey on the geology of southern New Brunswick.

Dr. G. F. Matthew has been employed in collating the evidence as to the age of the series of red rocks in New Brunswick first described by the late Dr. A. Gesner as the Old Red Sandstone, but by most later writers as Lower Carboniferous. The absence of marine organisms makes the determination of their age difficult, but seemingly both Devonian and Carboniferous deposits are present.

#### BOTANY (G. U. Hay, *Chairman.*)

On the 28th April last Rev. W. F. Gaetz and Clarence Thompson found, well established on limestone rocks near St. John the *Daphne Mesereum*, whose purple rose-colored flowers were fully expanded at that early date. This plant is probably an escape from an old garden in the vicinity many years ago. This is its first recorded appearance in New Brunswick.

The summer outings of the Society furnished material for observation in the localities visited. At Douglas Mountain, on the 24th June, the rocks on the summit were found to be abundantly covered with *Potentilla tridentata* in flower while the woods on the way up were fragrant with the perfume of the Twinflower *Linnæa borealis*. Some fine trees of red and white pine were seen on the southern exposure of the mountain.

At Ashburn Lake which the members of the Society visited on the 5th July, some fine specimens of the mountain fly-honeysuckle (*Lonicera Canadensis*) were observed in fruit and in the woods near the lake an abundance of ground hemlock (*Taxus Canadensis*).

At Woodman's Point, July 15, the four-leaved loosestrife (*Lysimachia quadrifolia*) was observed, its only known habitat in the province. The fox-grape (*Vitis vulpina*), witch hazel and other interesting plants were observed along the shore.

At Clifton on the 25th July a loosestrife (*Lysimachia punctata*) an introduced plant, not hitherto reported from this province, was found. The star thistle (*Centaurea nigra*) was especially abundant on the hillside above Clifton, and specimens of the fern, *Woodsia Ilvensis* were found on the cliffs adjacent.

The outing at Drury's Cove, August 5, gave the members an opportunity to see many plants growing in limestone regions. The bladder fern (*Cystopteris bulbifera*) some of whose fronds measured three feet in length was found, and many patches of the shrubby potentilla (*Potentilla fruticosa*) with its yellow blooms were observed among the rocks along the shore.

A few flowers of that rare plant, Sneeze-weed (*Achillea Ptarmica*) were observed on the shore at Caton's Island, August 19, on the occasion of the combined Historical and Natural History Societies excursion. The island is covered with a fine growth of hardwood, pines and spruces. It is also interesting on account of the large number of St. John River plants found along its shores.

#### ORNITHOLOGY (A. Gordon Leavitt, *Chairman.*)

Their is little to report as outside work done in this department and, on account of the vast amount of work devolving on the Curator in connection with the changes and alterations in the building the whole collection has not, as yet, been re-arranged but nevertheless it still continues to be one of the chief attractions of the museum. It is a pleasure to be able to report two birds as new to St. John County, a carrion crow or Black Vulture (*Catharista atrata*) and a Wood Ibis (*Jantalus loculator*) the former taken at Spruce Lake, on July 17th last, and the latter at Crouchville, on June 3rd.

In Bulletin I. of this Society, Chamberlain reports the carrion crow under No. 240, among the birds which have not been observed in St. John or Kings Counties, as follows—"Mr. Boardman writes me that he has had some half a dozen of this species taken near St. Stephen." The range of the normal bird in the United States is given as "not extending beyond the Carolinas," but a few captures are recorded from Massachusetts and Maine.

The Wood Ibis, also known as Water Turkey or Colorado Turkey, is stated to range from southern South America to south-eastern California, Arizona and the Gulf Coast, wandering in summer northward through the lower Mississippi valley to Missouri, irregularly to Utah, Colorado, Indiana and Wisconsin, and casually to Ohio, Pennsylvania and New York. So it will be noted that the presence of the bird so far north is probably a very unusual occurrence.

ARCHAEOLOGY (William McIntosh, *Chairman.*)

During the past three years your Committee on Archaeology has not presented a report. During this time considerable field work was done, resulting, in the Society's collection of prehistoric Indian relics being increased over four fold. This great accession of material was due largely to the gifts of a number of local collectors, who generously gave to the museum; specimens which were the result of many years collecting.

Among other donors, Mr. David Balmain, of Indian Point, presented 227 specimens. Mr. Duncan London of Lakeville Corner, 157 specimens; Messrs. John, Harry and Leslie Gunter of Upper Jemseg, over 100; Mr. Chas. Coakley, Douglas Harbor, Mr. Melbourne Dykeman, Upper Jemseg, and others, smaller collections. A full list of those who presented articles will be found in the yearly reports.

During the summers of 1909, 1910, 1911, the Curator accompanied by members of the Society, visited a large number of pre-historic camp and village sites in central New Brunswick. Sketch maps were made, and a great deal of valuable data was obtained regarding the archaeology of the Province. Savage Island on the St. John River was the most northerly place visited. At the upper end of this island we obtained a fine plummet, a stone axe, arrowheads, pottery and quantities of chips giving evidence of an Indian encampment having been situated here in former times. We camped on Ministers Island; according to local tradition this was an Indian burial place, but we were not able to find any trace of graves. A number of the islands in the vicinity were searched but with little success.

In 1910 the Oromocto River and French Lake were visited. A number of Indian camping places were found. The most important was situated on the high ground on the north-east side of French Lake. A large number of stone implements have been found here, and when the ground is newly ploughed the wigwam sites may be traced by the burned earth, ashes and decayed animal matter which has blackened the earth. The pictograph, photographed and described by Prof. Ganong, was examined. We were not able to find much here, a very fine arrowhead, and a stone ornament being the most interesting. Messrs. Merrit C. Smith, C. C. Smith, J. A. Smith and Vance E. Smith gave a number of good specimens and showed the party much kindness.

In the village of Oromocto all traces of the large Indian encampment which once existed here has entirely disappeared. The village probably covers the original site.

Near the centre of the village we were shown the place where a number of Indian graves were found. After leaving Oromocto we paddled to Lower Maugerville and portaged to the Portobello stream, down which we paddled our birch canoe, as so many thousands of our Indian predecessors have done in by gone years. This region from the headwaters of the Portobello to the mouth of the Jemseg was probably one of the most important aboriginal hunting and fishing places in New Brunswick. Almost all of this area is a great alluvial flat probably once the bed of an immense inland lake of which French, Maquapit, Grand, Washedemoak Lakes and Bellisle Bay are remnants. The first three named are connected by narrow, deep channels locally known as thoroughfares. The waters of these lakes finds an outlet through the Jemseg, which drains even at low stages of the river an area of fourteen hundred square miles.

Thousands of acres of this land are submerged in the spring freshets or floods. It is a common thing for a farmer to obtain a crop of fish and a crop of vegetables from the same piece of ground each year. Even today these channels or thoroughfares swarm with fish, and the swamps and lakes abound with wild fowl. Although the writer has visited the Portobello many time

he has never done so without seeing moose or deer. This region must have been a veritable "happy hunting ground" for the Indian.

Throughout this region and more particularly on the banks of the channels we find abundant evidence of Indian occupation.

Indeed this area has produced more stone age remains than any other part of New Brunswick. Part of this region has been carefully searched by Messrs. Duncan London and David Balmain, and almost the entire area has been visited by members of this Society.

A brief summary of the work of the past three years in this country is given below. As previously stated almost throughout the entire length of the Portobello stream in nearly all the situations suitable for camping, we found evidence of Indian occupation, chips, whole and broken implements, fire stones, etc. No pottery or anything to indicate permanent settlements were found. A permanent camp would not be possible on this stream as the entire area is submerged each spring. All the evidence went to show the Portobello was a much frequented hunting and fishing ground and not a permanent dwelling place.

On French Lake there were probably some permanent camps near the old fish house opposite Sand Point. On Apple Island and on the upper end of the small island which divides the channels leading into Maquapit Lake, flakes pottery and stone implements were found in such quantities as to indicate camp sites.

On Maquapit Lake, Ring island has produced great quantities of Indian remains and was probably a favourite camping place; here our party found little, some pottery, an arrowhead or two, and broken implements. Mr. London has done some excellent work here; and has apparently collected all the material obtainable, the same may be said of Indian Point where the veteran collector David Balmain has gathered relics of the stone age for many years. At these two localities hundreds of specimens have been obtained. At present, one is fortunate who finds two or three objects at these places. Judging from the abundance of material found, Indian Point must have been a camping place or village site of some importance in ancient times.

At the Keyhole (Princess Park) Grand lake, we were able to obtain aboriginal pottery in some quantities. Mr. A. G. Leavitt and the Curator spent some time digging for pottery in 1908, and in 1909 the Curator, accompanied by members of the Society, spent about a week searching for pottery. Over two thousand fragments were obtained. This pottery is described in an article published in the bulletin of this Society. We wish to express our acknowledgement of the great kindness of the late Dr. E. Stone Wiggins, the owner of this beautiful estate, who took the greatest interest in our work, and to Mrs. Wiggins, who extended the hospitality of her home to the members of our party.

Chas. M. Coakley, whose farm is near the Keyhole, gave a collection of arrow and spear heads found in the vicinity, and both he and Mrs. Coakley were most kind.

In past years a large number of stone age relics have been found on the farms owned by Isaiah Gunter and Mr. Dykeman, situated on the south shore of Grand lake, near the entrance to the Jemseg. Here we found pottery fragments, flakes and some implements, abundant evidence to prove the existence of an important camping place or village site.

Messrs. John, Harry and Leslie Gunter presented the Society with a large number of specimens found in this place. Two well marked camp sites were found on the Jemseg, one near the entrance to Grand lake and the other a short distance above Upper Jemseg wharf. Mr. Melbourne Dykeman presented a number of specimens found at these places.

At Swan lake we discovered two pre-historic camping places. At all the localities mentioned we obtained specimens of various kinds.

#### BUILDING (T. H. Estabrooks, *Chairman.*)

When the building now occupied by the Society was purchased five years ago, it was felt that a number of changes were necessary to make the rooms suitable for the proper display of the Society's collections and for carrying on its work. At that time it was

only possible to make a portion of the changes contemplated. It was not until the past year that we were able to undertake these improvements. Below will be found a summary of the improvements made.

The museum was formerly lighted with gas, the pipes were leaky and the fixtures unsuitably placed for our purposes. It was decided to light the building with electricity.

The fixtures are of burnished brass with tungsten lamps and holophane reflectors. The plan of lighting adopted, was decided upon after a careful study of the methods employed by the more modern museums elsewhere.

The sanitary arrangements have been entirely changed. The bath room and toilet fixtures were worn out and leaking. A large cistern occupied much space on the second floor and being unnecessary has been removed. On the ground floor the room formerly used as a kitchen by the associate members has been made over, with two toilets, one for ladies, the other for gentlemen. These are provided with hot and cold water. A room on this floor has been fitted up as a kitchen for the use of the associate members and is provided with a china closet, tables, gas stove and a pantry sink with hot and cold water.

Between the library and the historical department was a dark room and two closets. By the removal of partitions the space occupied by these has been added to the archaeological department doubling the size of the room. Nothing has been done in the library, but the committee have under consideration some improvements for this room.

On the west side of the second floor two closets and a dark bath room occupied the space between the botanical and invertebrate rooms, by the removal of partitions these rooms now form one large room fifty feet in length.

On the third floor a new window has been made in the west wall, lighting what was formerly a dark room, this has been fitted up as a bath room. On this floor a room has been shelved and will be used as a library.

In addition to the changes described, a large number of minor improvements have been made in various parts of the building.

These changes will give the Society a splendid suite of exhibition rooms and rooms for carrying on its work.

The Building Committee's estimate of the costs of changes in the building was \$1,200.00. One thousand two hundred and seven dollars was spent.

The estimate by your committee did not include any changes in the library or repairs which we find will have to be made on the west wall of the building and elsewhere.

#### LECTURES (G. U. Hay, *Chairman.*)

Ten regular meetings of the Society were held during the year, beginning October 4 and ending June 6. At the meeting of October 4 the report of the delegate to the Royal Society was received; October 18 the annual meeting was held; and on November 1 there was a business meeting and afterwards a reunion of the members and associate members of the Society, a very enjoyable occasion.

The Six Meetings following were devoted to the Natural History of Rockwood Park and Vicinity (Illustrated):

December	6—The Physical Features.—G. F. Matthew, LL. D., D. Sc.
January	3—The Flowering Plants, Trees and Shrubs.—G. U. Hay, D. Sc.
February	7—The Ferns.—W. J. S. Myles, A. M.
March	7—The Six-Footed Inhabitants.—Wm. McIntosh.
April	4—The Mammals.—J. W. Banks.
May	2—The Birds.—A. Gordon Leavitt.
June	6—Physiographic Observations upon the Dungarvon and Bartholomew Rivers.—Prof. W. F. Ganong, Ph. D.

In addition to the regular course a series of Popular Lectures was given during the winter on the Tuesday evenings not occupied by the regular meetings of the Society. These were open to teachers, students and the general public, as well as to the members. (The first six illustrated lectures were kindly provided free by the Library of McGill University, Montreal.)

January	10—Newfoundland and Labrador.
January	17—The River and Gulf of St. Lawrence.
January	24—British Columbia and Alberta.

January 31—Our Native Birds.  
February 14—The Wood-Pulp Industry of Canada.  
February 21—Forestry.  
February 28—An Anglo-American Alliance.—Silas Alward, K. C., D. C. L.  
March 14—Things not generally seen.—The Photographic Section of the Society.  
March 21—What the Rocks have to tell us.—L. W. Bailey, Ph. D., LL. D.  
March 28—Microscopic Illustrations.—William Warwick, M. D.

In addition to the above the Ladies' Association conducted two courses of lectures; and there were weekly talks in the afternoon on science, travel and museum topics for the junior members.

PRESS (G. U. Hay, *Chairman.*)

The Society is much indebted to the daily press of St. John for notices of meetings, and for the publicity given to its varied activities during the past year.

### FIELD MEETINGS.

CATON'S ISLAND (G. U. Hay.)

On Saturday, August 19, the members of the Natural History Society joined with the members of the New Brunswick Historical Society to commemorate the three hundredth anniversary of the founding of the first settlement in New Brunswick, by unveiling a stone tablet on Caton's Island near Brown's Flat on the St. John River. The tablet which was strongly cemented into the face of a cairn, constructed for the purpose, overlooks the cove into which entered some sailors and traders from St. Malo, France, in the year 1611, who established the first known settlement in New Brunswick. The Island which is now the property of Jas. Lowell, Esq., M. P. P., has had several owners in recent years. Its Indian name, and the only one recorded in its early history, is Emenenic; and it would seem fitting now in view of the recent memorial celebration, to revert to its old name.

The harbor where these early settlers sought refuge is deep and well sheltered and there are springs of good water on the

shore, conditions which exist nowhere else on the island. The whole surface is well wooded. Fine trees of beech, oak, birch, maple, spruce and pines, of good size are found all over the island, which has a circuit of about three miles and is the first large island met with on the river.

The vice-president of the Natural History Society, Dr. Matthew, and the president of the Historical Society, Mr. T. O'Brien, performed the ceremony of unveiling the tablet. Venerable Archdeacon Raymond in a brief address gave the principal historical events of the settlement and Dr. G. U. Hay reviewed more recent events in its history. Judge J. R. Armstrong presided.

The new ferry steamer, the Governor Carleton, was kindly placed at the disposal of the two societies to convey passengers to and from the island. About 120 only availed themselves of the privilege, the early part of the day being stormy, but the afternoon being fine, motor boats and other crafts crowded into the cove making a lively and impressive scene.

#### OUTING AT WOODMAN'S POINT (G. U. Hay, *Leader.*)

The outing at Woodman's Point on Saturday, July 15, was well attended. The day was one of the pleasantest of the season. The beautiful grove on the grounds of Mrs. Woodman furnished a refreshing shade, from the borders of which a fine view of the St. John and Nerepis valleys could be obtained.

In the absence of Dr. Matthew, Mr. W. F. Burditt gave a brief outline of the geology of the region, and the causes of the land shaping itself into such a noble contour of hill and valley as were to be witnessed from this commanding elevation.

Rev. Mr. Winter of London, the Society's guest for the day, gave a picturesque account of an Italian country scene he had witnessed on a recent journey there, contrasting the old world scenery with the freshness and beauty of the scene before them.

G. U. Hay described the plants the party had observed during the afternoon, among them the fox-grape (*Vitis vulpina*) so frequently alluded to by early voyageurs on the River St. John,

the juice of which was more frequently made into vinegar than wine by the first settlers; the three-toothed cinquefoil (*Potentilla tridentata*) one of the Arctic plants of the glacial epoch which was left stranded on our rocky hillsides and mountains from that remote period, and has since flourished in these situations; the four-leaved loosestrife (*Lysimachia quadrifolia*) a beautiful plant, from two to three feet high, found in the grove of oaks near the mouth of the Nerepis, its only known habitat in New Brunswick. The witch-hazel, different forms of willows and other shrubs and trees found in great variety along the shore, were also referred to and described.

A brief address was given by Mrs. Woodman who referred to some incidents in the history of the place, notably the career of General Coffin whose grave the members of the Society had visited during the afternoon and who at one time held a large grant of land at the mouth of the Nerepis. She also showed a very old violin that had been in possession of her family for more than a hundred years.

#### FIELD MEETING AT CLIFTON, 26th July, 1911.

The party left Indiantown at nine, in the Steamer Hampton, and had a fine opportunity to see the Pre-Cambrian granite and limestone in the lower part of the Narrows above Indiantown, and the Red sandstones and conglomerates that border the Narrows on the east side, in the upper part, where that passage opens out into Grand bay.

Passing Boar's Head, which is composed of these red sandstones and conglomerates, the steamer entered the Kennebecasis river, where it has considerable width and shows much diversity of scenery in the more distant shores, due to the variety of kinds and age of the subjacent rocks.

Passing into the North channel behind Long island the members of the party had an excellent opportunity to contrast the bold and continuous range of hills of trap rock on the north side of the river, with the tamer shores of red sandstone and

conglomerate on the south side, broken into islands and coves by the long continued denudation, or wear, of many geological ages.

Arriving at Clifton the party rested for a while at the Public Hall placed at their disposal by Mr. Burton Flewelling and then those who felt able for the task undertook to climb the "mountain" at the east end of the village, formerly known as Snider's mountain, now as Buckley's. From the top of this hill there is an extensive view down the Kennebecasis; bays and channels of the river alternate with islands and low hills and ridges that conduct the eye to the steeples of St. John and the waters of the Bay of Fundy.

To the southwest beyond the river, are seen a succession of ridges and valleys of the red sandstone formation which seem low and smooth compared with the rugged volcanic hills of great antiquity around Clifton.

To the northwest appears the rounded outline of Blue mountain on the further side of the St. John river, which here is about five miles away.

On the Snider mountain lies a boulder of grey granite that must have been brought by ice from Hampstead on the St. John river: it is scored and weathered — a memento of the Great Ice Age when the whole surface of the country was overrun and overlain by glacier ice of many hundreds of feet in thickness.

After luncheon in the Public Hall in Clifton addresses were given by the several members who had conducted parties of observation in the neighborhood, one of which by Mrs. Lawrence, on the birds observed, was particularly interesting. The party returned by the Hampton, which about this time arrived from her trip up river.

Respectfully submitted,

JOHN G. MCKINNON,

*Secretary to Council.*

## THE LADIES' ASSOCIATION.

The Ladies' Association of the Natural History Society are happy to report another year of successful work for the Society, which practically means for the benefit of the citizens of St. John.

Our lecture courses of last year were a decided success from a literary as well as from a financial standpoint. The lectures on "Folk Lore in Opera" were much appreciated by the audiences, and were also a great benefit to those who prepared them.

The free lectures given in January, February and March were not behind the earlier course in value and interest. That we were able to introduce some of our younger members as lecturers has set an example that we hope will be followed during the coming season.

The charming afternoon with Robert Louis Stevenson was a great pleasure to the children who took part, as well as to those who were present as audience and we owe a debt of gratitude to the ladies who gave their time and thought to its preparation.

Last winter also our Junior members assisted by Miss Sutherland, made their first effort, in giving us the very pretty cantata "The 'Pied Piper.'" It was creditably done and we hope is only the first of their annual entertainments.

With the money raised by our autumn course, supplemented by these extra entertainments, the Ladies' Association have paid all but \$25 on the piano purchased by them in the fall. The piano is a good one and cost \$250. It has been, and we hope will be a great addition to the pleasure and usefulness of the gatherings in this hall.

The Ladies fully appreciate the advantages of the improved arrangements made in the museum and building during the past summer, and are satisfied that they will ensure an increased interest in the work of the Society in all its branches.

In addition to the annual conversazione or reunion of members when the ladies' gave their help in providing music and refreshments which help on the social side of the entertainment, there were held last winter three social evenings for the purpose of giving the members and their friends an opportunity of examining the various collections in the museum, under

the guidance of members of the society who were experts in different departments. On one occasion we invited the University Club, who repaid the courtesy by giving us an excellent paper on Paracelsus. On another day we asked the Rector of Rothesay School to bring in any boys old enough to be interested, about fourteen or fifteen came and I am sure enjoyed the evening. Again we invited the Educational Class of the Kings Daughters who seemed to enjoy the occasion thoroughly. A short musical program was provided each evening and light refreshments at the close of the entertainment.

Our membership continues about the same as last year. We have lost some by withdrawal, several by removal and a few by death. Among the latter, there is no one who will be so much missed as Mrs. D. J. Leavitt, whose kindly presence and bright cheery countenance was to be found at almost every meeting.

Our lecture courses for this fall and winter have been arranged, and will we hope, not fall behind in value or interest those of other years. We are glad to welcome one or two new lecturers to our platform and in recalling our motto that "Progress is the Law of Life" we look forward hopefully to the progress we hope to make during the coming year with the blessing on our work of Him who said: "I am come that they might have Life, and that they might have it more abundantly."

K. M. MATTHEW, *President.*

TREASURER'S REPORT LADIES' ASSOCIATION.

*Receipts—*

1910—	Course Tickets Receipts.....	\$166 25
1911		
March	Mrs. Ellis Lecture Receipts.....	29 25
March	Stevenson Lecture Receipts.....	38 50
April	Pied Piper Lecture Receipts.....	32 25
May	Donation, Miss Jardine of Boston.....	10 00
		_____
		\$276 25
	Advanced by Treasurer.....	13
		_____
	Carried forward.....	\$276 38

<i>Brought forward, . . . . .</i>		\$276 38
<i>1911      Expenditure—</i>		
Oct. Cash Loaned by Treasurer Returned. . . . .	\$28 00	
Hire of Organ Twice. . . . .	4 00	
McMillan's Bill. . . . .	1 30	
Coaching, E. D. Starkey. . . . .	2 50	
Coaching, R. T. Worden. . . . .	4 50	
Pied Piper Music Bill. . . . .	4 00	
Evening Times Adv. . . . .	3 08	
Tuning Piano Twice to Organ Pitch. . . . .	4 00	
Paid on Piano. . . . .	225 00	
	—————	\$276 38

GRACE W. LEAVITT, *Treasurer.*

### JUNIOR ASSOCIATE BRANCH.

*To the President of The Natural History Society.*

Herewith I submit the annual report of the Junior Associate branch of The Natural History Society as follows:—

There are thirty members in the girls branch. At a regular monthly meeting, held on Monday, April 12, 1911, officers were elected for the coming year as follows:—

President, Edith M. Kee; Vice-Presidents, Vivien Freeze and Maud Willis; Secretary, Mary L. Murdoch; Treasurer, Janet H. Freeze.

On Friday, March 29th, an entertainment had been held to raise funds to assist in paying for the piano. This was in the form of a cantata "The Pied Piper of Hamlin." We owe a great debt of gratitude to Miss Maude Sutherland who trained not only the girls but the boys for this. The entertainment was held in the Lecture Room of the N. H. S. The sum of \$32.57 was realized.

Several outings through the spring and fall, chaperoned by Mr. and Mrs. McIntosh, were greatly enjoyed, kind friends taught the members many interesting and instructive things about nature. We visited Riverside, Green Head, Drury Cove,

Pokiok, Bay Shore and many other places. The girls were invited to "Camp Nature" on the Nerepis river, to spend the King's birthday and all had a delightful time.

The most enjoyable and important feature of the year was the camping trip. Mr. McIntosh invited all the girls to accompany him and Mrs. McIntosh on his collecting trip. There were eighteen in the party altogether. We were joined by Mr. Leavitt and two of the boys, Cris. Armstrong and Douglas Holman. We visited many Indian encampments; starting at Gagetown we toured Grand Lake, French Lake, Maquapit Lake and French River, finding many Indian relics. We were away from August 4th, to 24th.

Hoping to accomplish as much next year.

Respectfully submitted,

MARY L. MURDOCH,

November 7, 1911.

*Secretary.*

#### JUNIOR REPORT.

During the past year the Junior members have held some ten regular monthly meetings. These meetings have been well attended. The boys have also held several outings, during the spring and fall to points near the city and in July they camped on Grand Lake and assisted Mr. McIntosh in searching for Indian relics. Over three hundred different kinds of flowers have been found by the boys during the summer. Two of the members took all the prizes in Natural History except for mounted birds at the Fredericton Exhibition in September, and several received prizes for Natural History exhibits at the Arts and Crafts Exhibition of the St. John Y. M. C. A. In no previous year have the Junior members taken such an intelligent interest in nature.

## DONATIONS.

## ARCHÆOLOGY AND ETHNOLOGY.

ARMSTRONG, COL. J. RUSSELL—Ancient pottery from Tel el Amarna, Egypt. Figure taken from one of the tombs at Sakkarah near Cairo. The tombs were built about 3,500 B. C. Purchased by the donor from the Government Museum at Cairo.

BULLOCK, MRS. JOHN—Three necklaces or neck ornaments, bread tray of woven grass, wooden spoon all from Africa.

BAILEY, MRS. L. W., Fredericton—Birch bark, scrap basket made by Malecite Indians.

GRANT, MRS. C. W., Hope.—Feather fan made by natives of South America.

HUMPHREY, R. B.—Bone fish hook made and used by the Stick Indians, Yukon.

JACK, THE MISSES—Seven pieces of moose-hair embroidery work, made by Indians of Quebec. Modern Indian mask, bead work wall pocket, made by Alaska Indians. A very fine example of Micmac porcupine quill work, made by the "Queen of the Micmacs," Cape Breton; Four pieces of beadwork made by Malecite Indians, fine specimens of the beadwork of fifty years ago. Two valuable Indian stone pipes.

LEAVITT, MRS. D. J.—Small tray made of seeds, the work of West Indian natives.

SACOBI, MICHAEL—Stone maul or hammer, basket maker's knife, gauges, splints and other material used by the Malecite Indians in basket making.

SACOBI, MRS. MICHAEL—Two baskets, copied from an ancient type of basket no longer made by the Malecite Indians.

SALMON, MRS. JOHN G.—Cap made of coloured seeds by West Indian natives.

## ZOOLOGY.

BENNETT, MRS. W. R.—Coral, West Indies.

CONNORS BROS., Blacks' Harbour.—Bill fish taken in the Bay of Fundy.

CRAIBE, MRS. F. E.—Mounted kingfisher and humming bird in glass globe.

HAMILTON, MRS. GEO. A.—Worm shell.

HARRINGTON, MISS—Mossy gall on rose-bush.

HATHeway, W. FRANK—Sea shells from Fiji Islands.

PATERSON, A. P.—Glass case containing 31 specimens of New Brunswick birds and a mounted specimen of the Snowy Owl.

WELDON, CURRIE—Cast skin of locust.

## BOTANY.

ARMSTRONG, COL. J. RUSSELL—Flowers from Garden of Gethsamane.  
 BENNETT, MRS. W. R.—Sea weed, West Indies.  
 DAVIDSON, JOHN H.—Branch of cotton plant showing ripe balls.  
 HOWE, JOHN—Portion of tree showing very curious growth.  
 PROVINCIAL GOVERNMENT (Agricultural Department)—Preserved fruits.

## PALÆONTOLOGY.

LEAVITT, A. GORDON—91 pieces of slate with fossil plants collected at Seaside Park by the donor.

## MINERALS.

ARMSTRONG, COL. J. RUSSELL—Pebbles from shore of Dead Sea, Water from Dead Sea, stone from Jericho. Fragment from the Great Pyramid Egypt, Pumice stone from Mt. Vesuvius, piece of stone from “house of Mary and Martha” Bethany. Rock from the vestibule of the Church of the Nativity, Jerusalem, Galena.  
 GIBBS, MISS ELIZABETH—Agate ring.  
 HATHeway, W. FRANK—Stalactite from Matanzas, Cuba.

## COINS AND MEDALS.

BENNETT, CAPT. W. R.—Roman and old Italian Coins.  
 BAIRD, C. A., San Francisco Cal.—United States Coin 1904.

## GENERAL.

AGRICULTURAL DEPARTMENT, Provincial Government of N. B.—Photographs of N. B. Orchards.  
 ARMSTRONG, CHRISTOPHER—Portion of old grub hoe from Indian Point.  
 HAMILTON, MRS. GEO. A.—Illuminated card.  
 LONGMAID, MISS—Relic of the great fire in St. John, 1877.  
 YOUNGHUSBAND, MRS.—Hand-warmer.

## LIBRARY.

ALWARD, Silas D. C. L., C.—Essay “Our Western Heritage”.  
 BOYD, REV. HUNTER—Egypt exploration fund, archæological report, special report, Egypt exploration fund. Evolutional Ethics and Animal Psychology. The Religious life in its scientific aspect.  
 BULLOCK, MRS. JOHN—An old work printed in 1788.  
 FARMER, MISS—Abridgment of Goldsmith’s, Natural History of Quadrupeds and birds 1831.  
 HALL, MRS. T. H.—Reprints of the Times and other early English newspapers and historical documents.  
 HAY, Dr. G. U.—Foote’s Catalogue of Minerals.

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